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PROGRAM AND ABSTRACTS OF THE TWENTIETH ANNUAL MEETING OF THE AMERICAN SOCIETY OF PARASITOLOGISTS

SAINT LOUIS, MISSOURI

MARCH 28, 29, and 30, 1946

PROGRAM[1]

THURSDAY MORNING SESSION, MARCH 28, 10:00 AM; MUNICIPAL AUDITORIUM.

Read

1. Comparison of Methods Used for the Detection of *Endamoeba histolytica.* (7 min) OSCAR FELSENFELD, Mt. Sinai Medical Research Foundation, Chicago.

2. The Staining of Protozoa in Formolized Stool Specimens. (6 min) VIOLA MAE YOUNG, Mt. Sinai Medical Research Foundation, Chicago.

3. The Influence of Whole Egg Inoculum on the Growth of *Endamoeba histolytica*—Organism *t* in Enriched Egg White Medium and in Whole Egg Dialysate Medium. (15 min) (Lantern) CHARLES W. REES, LUCY V. REARDON, ELEANOR M. JOHNSON, AND M. FRANCES MAYFIELD, National Institute of Health.

4. Pathogenicity of Pure Culture *Trichomonas gallinae* Orally Administered to Clean Pigeons. (10 min) ROBERT M. STABLER AND FRANK B. ENGLEY, JR., University of Pennsylvania.

5. Further Studies on the Inoculations of *Trichomonas foetus* (Protozoa) in Heifers. (12 min) (Lantern) BANNER BILL MORGAN, University of Wisconsin.

6. Toxicity of Cecal Cores from Chickens Infected with the Protozoan, *Eimeria tenella.* (10 min) MARY JANE BRADFORD AND C. A. HERRICK, University of Wisconsin.

7. Dosage of *Eimeria stiedae* Related to Severity of Liver Coccidiosis. (12 min) (Lantern) HARRY A. JANKIEWICZ, College of Osteopathic Physicians and Surgeons, Los Angeles.

THURSDAY AFTERNOON SESSION, MARCH 28, 2:00 PM; MUNICIPAL AUDITORIUM.

Read

8. Cryptozoites and Metacryptozoites of *Plasmodium relictum* in Canaries and Pigeons. (12 min) (Lantern) FREDERICK COULSTON AND CLAY G. HUFF, University of Chicago.

9. *Plasmodium circumflexum* in the Ruffed Grouse in Ontario. (15 min) (Lantern) A. MURRAY FALLIS, Ontario Research Foundation, Toronto.

[1] An alphabetical author index will be found at the end of the program. Extra copies of this Supplement, and portraits of parasitologists, will be on sale at the meeting.

10. Studies on *Plasmodium gallinaceum* Brumpt. IV. Parasitemia and Survival in Blood-Induced Infections in Young Chicks. (15 min) (Lantern) W. Clark Cooper and G. Robert Coatney, National Institute of Health.

11. Studies on *Plasmodium gallinaceum* Brumpt. VI. A Study of the Pathology in Young Chicks. (15 min) (Lantern) Lloyd R. Hershberger and G. Robert Coatney, National Institute of Health.

12. *In vitro* Studies on Malarial Sporozoites. (15 min) (Lantern) Richard J. Porter, Raymond L. Laird, and Elizabeth Dusseau, University of Michigan.

13. Observations on the Courses of Infection in Sporozoite-Induced *Plasmodium cynomolgi* Malaria. (15 min) (Lantern) Raymond L. Laird and Richard J. Porter, University of Michigan.

14. *Plasmodium elongatum* in Pekin Ducks. (15 min) (Lantern) Fruma Wolfson, Johns Hopkins University.

15. The Relations between Pantothenic Acid and *Plasmodium gallinaceum* Infections of the Chicken. (15 min) (Lantern) Sterling Brackett and Emanuel Waletzky, American Cyanamid Company, Stamford Connecticut.

16. The Relative Activity of Sulfanilamides and Other Compounds in *Eimeria tenella* Infections in the Chicken. (15 min) (Lantern) Emanuel Waletzky and Carrie Ola Hughes, American Cyanamid Company, Stamford, Connecticut.

17. Aspects in the Control of Intestinal Coccidiosis in Commercial Rabbitries by the Use of Phthalylsulfathiazole. (12 min) (Lantern) Everett E. Lund, United States Rabbit Experiment Station, Fontana, California.

By Title

18. Chemical Studies on Egg White Medium for the Cultivation of *Endamoeba histolytica*. Theodor von Brand, Charles W. Rees, Lucy V. Reardon, and William F. Simpson, Catholic University of America and National Institute of Health.

19. Hexenolactone, an Effective Inhibitor of *Trypanosoma cruzi* growth *in vitro*, but not *in vivo*. Theodore S. Hauschka, N. du Bose Maxwell, and Eleanor M. Johnson, Lankenau Hospital Research Institute and National Institute of Health.

20. Studies on *Plasmodium gallinaceum* Brumpt. V. Quinine Standardization in Screening Tests Against Blood-Induced Infections in Young Chicks. G. Robert Coatney and W. Clark Cooper, National Institute of Health.

Friday Morning Session, March 29, 9:00 AM; Municipal Auditorium.

Read

21. The Life History Cycle of *Dioctophyma renale*, the Giant Kidney Worm of Man and Many Other Mammals. (15 min) (Lantern) Arthur E. Woodhead, University of Michigan.

22. Epidemological Investigations on Filariasis on Certain Islands of the South Pacific Area. (12 min) (Opaque projection) Elon E. Byrd, University of Georgia.

23. Studies in Filariasis. II. A Skin Test for Filariasis *bancrofti* Utilizing Antigen Prepared from Microfilariae of *Wuchereria bancrofti*. (15 min) (Lantern)

GEORGE W. HUNTER, III, JOHN BOZICEVICH, AND VIRGINIA G. WARREN, Army Medical School and National Institute of Health.

24. The Biological Status of *Sarcocystis*. (15 min) L. A. SPINDLER AND HARRY E. ZIMMERMAN, JR., U. S. Bureau of Animal Industry.

25. Studies on Imported Malarias: 4. The Infectivity of Foreign Malarias to Anophelines of the Southern United States. (12 min) (Lantern) MARTIN D. YOUNG, TRAWICK H. STUBBS, JOHN M. ELLIS, ROBERT W. BURGESS, AND DON E. EYLES, United States Public Health Service.

26. Vectors of Scrub Typhus. (15 min) (Lantern) G. W. WHARTON, U. S. Naval Medical Research Unit No. 2 and Duke University.

27. Laboratory Studies on the Snail Host of *Schistosoma mansoni*. (15 min) (Lantern) ELOISE B. CRAM AND VIRGINIA S. FILES, National Institute of Health.

28. A Group Research Project on Biological Phases of *Schistosoma japonicum* and *S. mansoni* Infections. (15 min) (Lantern) WILLARD H. WRIGHT, National Institute of Health.

FRIDAY MORNING SESSION, MARCH 29, 11:00 AM; MUNICIPAL AUDITORIUM.

Presidential Address

29. The Making of a Parasitologist, ASA C. CHANDLER, Rice Institute.

FRIDAY, MARCH 29.

12:30 PM. PARASITOLOGISTS' LUNCHEON.

1:30 PM. ANNUAL BUSINESS MEETING.

FRIDAY AFTERNOON SESSION, MARCH 29, 3:00 PM. (TEA WILL BE SERVED).

By Demonstration

21. The Life History Cycle of *Dioctophyma renale*, the Giant Kidney Worm of Man and Many Other Mammals. (Also read) ARTHUR E. WOODHEAD, University of Michigan.

30. Sarcocystis in the Monkey. A Report of Two Cases. EDWARD P. OFFUTT, JR. AND IRA R. TELFORD, University of Rochester and George Washington University.

31. Liver Coccidiosis Prevented by Sulfasuxidine. HARRY A. JANKIEWICZ, College of Osteopathic Physicians and Surgeons, Los Angeles.

32. A New Species of *Opecoeloides* (Trematoda: Opecoelidae) from the Threadfin Fish, *Polynemus octonemus*. JANE HOGAN VON WICKLEN, University of Nebraska. (Introduced by H. W. Manter.)

33. Tumor Formation as a Reaction to *Litomosoides carinii*, a Filariid of the Cotton Rat. J. ALLEN SCOTT AND JOY BARNES CROSS, University of Texas.

34. The Application of Cytological Techniques to Cestode and Other Helminth Material. ARTHUR W. JONES AND HELEN L. WARD, University of Tennessee.

51. Motion Picture of *Cercaria clausii* Monticelli, a Marine Rattenkönig Larval Trematode from the West Coast of Florida. (Also read) RAYMOND M. CABLE AND R. A. MCLEAN, Purdue University and Academy of Natural Science of Philadelphia.

52. Schistosomiasis. (Also read) PAUL P. WEINSTEIN, U. S. Public Health Service.

53. The Laboratory Diagnosis of Schistosomiasis. (Also read) M. M. BROOKE, U. S. Public Health Service.

SATURDAY MORNING SESSION, MARCH 30, 9:00 AM; MUNICIPAL AUDITORIUM.

Read

35. Preliminary Report on the Distribution of *Onchocerca cervipedis.* (15 min) (Lantern) CARLTON M. HERMAN AND ARTHUR I. BISCHOFF, California Division of Fish and Game.

36. The Rate of Growth and Maturity of *Litomosoides carinii,* a Filariid of the Cotton Rat. (15 min) (Lantern) J. ALLEN SCOTT, University of Texas.

37. Anatomical Studies on the Fourth Stage Larvae and Adults of *Litomosoides carinii,* a Filariid of the Cotton Rat. (15 min) (Lantern) JOY BARNES CROSS AND J. ALLEN SCOTT, University of Texas.

38. Treatment of Canine Filariasis with Trivalent Arsenicals (P-Arseno-Benzamides). (15 min) (Lantern) GILBERT F. OTTO AND THOMAS H. MAREN, Johns Hopkins University.

39. The Treatment of Human Filariasis (*Wuchereria bancrofti*) by Administration of Melarsen Oxide. (15 min) (Lantern) HARRY M. ROSE AND JAMES T. CULBERTSON, Columbia University.

40. Studies of Sheep Parasites. VI. Observations on Weather in Relation to Untreated Nematode Infections. (10 min) (Lantern) PHILIP A. HAWKINS, Michigan State College.

41. Immunity to *Necator americanus* Infection. (10 min) PAUL C. BEAVER, Tulane University.

42. Infection Experiments with a Hookworm of the Cotton Rat. (10 min) (Lantern) LYELL J. THOMAS, University of Illinois.

43. Hydrogen Ion Concentration as a Factor in Age Resistance to the Fowl Ascarid. (12 min) (Lantern) B. B. RIEDEL AND J. E. ACKERT, Kansas State College.

44. An Anomalous Experience with Phenothiazine. (15 min) (Opaque projection) PAUL D. HARWOOD, Dr. Hess and Clark, Inc., Ashland, Ohio.

SATURDAY AFTERNOON SESSION, MARCH 30, 2:00 PM; MUNICIPAL AUDITORIUM.

Read

45. Studies on the Cystochrome Oxidase of the Pig Ascaris. (10 min) (Lantern) C. A. HERRICK AND MARIE THEDE, University of Wisconsin.

46. Additional Studies on the Effects of Nodular Worm Infections on Calves During the Prepatent Period. (15 min) ROY L. MAYHEW, Louisiana State University.

47. The Relationship in Mice of Intestinal Emptying Time and Natural Resistance to *Hymenolepis.* (10 min) (Lantern) JOHN E. LARSH, JR., University of North Carolina.

48. Cercarial Production in Snails and Metacercarial Infections in Fish from Carrol Lake, Wisconsin. (15 min) L. O. NOLF, University of Wisconsin, Wisconsin Conservation Department, and University of Iowa.

49. Ecology of the Metacercariae of *Fasciola hepatica* in Southern Texas and Its Relationship to Liver Fluke Control in Cattle. (15 min) (Lantern) O. WILFORD OLSEN, U. S. Bureau of Animal Industry.

50. Determination of the Life History of *Cercaria szidati,* a Furcocercous Larval Trematode of the *Vivax* Type. (10 min) (Lantern) DORCAS J. ANDERSON, Purdue University.

51. Motion Picture of *Cercaria clausii* Monticelli, a Marine Rattenkönig Larval Trematode from the West Coast of Florida. (5 min) (Motion picture) RAYMOND M. CABLE AND R. A. MCLEAN, Purdue University and Academy of Natural Science of Philadelphia.

52. Schistosomiasis. (15 min) (Motion picture) PAUL P. WEINSTEIN, U. S. Public Health Service.

53. The Laboratory Diagnosis of Schistosomiasis. (15 min) (Motion picture) M. M. BROOKE, U. S. Public Health Service.

By Title

54. Comparison of Methods for Diagnosing Schistosomiasis *japonica* by Recovery of Eggs from Feces. GEORGE W. HUNTER, III, JAMES W. INGALLS, AND MINNA G. COHEN, Army Medical School.

55. Periodicity of Microfilariae in the Philippines. J. L. AVERY, Naval Medical School.

56. The Thermal Death Point of *Cysticercus bovis*. REX W. ALLEN, U. S. Bureau of Animal Industry.

57. The Nature and Mechanism of Encapsulation in Trichiniasis. WAYNE W. WANTLAND, CORRINE L. BARDES, AND ROBERT S. LEVINE, Illinois Wesleyan University.

58. On the Distribution of Glycogen in the Trematode, *Ostiolum* sp. JAMES H. WILMOTH AND RHODA GOLDFISCHER, Brooklyn College.

59. Studies on the Respiration of the Frog Lung Fluke, *Ostiolum* sp. JAMES H. WILMOTH AND NORA LEVITAS, Brooklyn College.

60. A Note on the Genus *Axine* Abildgaard (Trematoda: Monogenea). EMMETT W. PRICE, U. S. Bureau of Animal Industry.

61. Additional observations on the Life History of *Gorgodera amplicava* Looss, 1899. CHAUNCEY G. GOODCHILD, Southwest Missouri State College.

62. Studies on Parasites of Bassalian Fishes. Ross F. NIGRELLI, New York Aquarium and New York Zoological Society.

63. Parasite Studies of Quail, *Colinus virgianus* and *Colinus virgianus texanus*, in Mississippi. J. W. WARD, Mississippi State College.

64. The Nematode Parasites of the Bufoninae (Amphibia-Salientia-Procoela-Bufonidae), I. A. C. WALTON, Knox College.

65. The Nematode Parasites of the Bufoninae, II. A. C. WALTON, Knox College.

66. The Nematode Parasites of the Bufoninae, III. A. C. WALTON, Knox College.

67. The Clinical Diagnosis of Schistosomiasis *mansoni* by Rectoscopic Biopsy. F. HERNANDEZ MORALES AND JOSÉ F. MALDONADO, University Hospital and School of Tropical Medicine, San Juan, Puerto Rico.

68. Schizomycetes parasitic in *Paramoecium bursaria*. RALPH WICHTERMAN, Temple University.

69. Chemotherapy of Filariasis (*Litomosoides carinii*) in the Cotton Rat by the Administration of Stibanose (= Solustibosan). JAMES T. CULBERTSON AND ELIZABETH PEARCE, Columbia University.

AUTHOR INDEX

Showing program number, which is also abstract number of each paper.

Author	*Program and Abstract Number*
Ackert, James E.	43
Allen, Rex W.	56
Anderson, Dorcas J.	50
Avery, John L.	55
Bardes, Corinne L.	57
Beaver, Paul C.	41
Bischoff, Arthur I.	35
Bozicevich, John	23
Brackett, Sterling	15
Bradford, Mary Jane	6
v. Brand, Theodor	18
Brooke, M. M.	53
Burgess, Robert W.	25
Byrd, Elon E.	22
Cable, Raymond W.	51
Chandler, Asa C.	29
Coatney, G. Robert	10, 11, 20
Cohen, Minna G.	54
Cooper, W. Clark	10, 20
Coulston, Frederick	8
Cram, Eloise B.	27
Cross, Joy Barnes	33, 37
Culbertson, James T.	39, 69
Dusseau, Elizabeth	12
Ellis, John M.	25
Engley, Frank B., Jr.	4
Eyles, Don E.	25
Fallis, A. Murray	9
Felsenfeld, Oscar	1
Files, Virginia	27
Goldfischer, Rhoda	58
Goodchild, Chauncey	61
Harwood, Paul D.	44
Hauschka, Theodore S.	19
Hawkins, Philip A.	40
Herman, Carlton M.	35
Hernandez Morales, F.	67
Herrick, Chester A.	6, 45
Hershberger, Lloyd R.	11
Huff, Clay G.	8
Hughes, Carrie Ola	16
Hunter, George W., III	23, 54
Ingalls, James W.	54
Jankiewicz, Harry A.	7, 31
Johnson, Eleanor M.	3, 19
Jones, Arthur W.	34
Laird, Raymond L.	12, 13
Larsh, John E., Jr.	47
Levine, Robert S.	57
Levitas, Nora	59
Lund, Everett E.	17
Maldonado, José	67
Maren, Thomas H.	38
Mayfield, M. Frances	3
Mayhew, Roy L.	46
Maxwell, N. du Bose	19
McLean, R. A.	51
Morgan, Banner B.	5
Nigrelli, Ross F.	62
Nolf, L. O.	48
Offutt, Edward P., Jr.	30
Olsen, O. Wilford	49
Otto, Gilbert F.	38
Pearce, Elizabeth	69
Porter, Richard J.	12, 13
Price, Emmett W.	60
Reardon, Lucy V.	3, 18
Rees, Charles W.	3, 18
Riedel, B. B.	43
Rose, Harry M.	39
Scott, J. Allen	33, 36, 37
Simpson, William F.	18
Spindler, Lloyd A.	24
Stabler, Robert W.	4
Stubbs, Trawick H.	25
Thede, Marie	45
Telford, Ira R.	30
Thomas, L. J.	42
Waletzky, Emanuel	15, 16
Walton, A. C.	64, 65, 66
Wantland, Wayne W.	57
Ward, Helen L.	34
Ward, James W.	63
Warren, Virginia G.	23
Weinstein, Paul P.	52
Wharton, G. W.	26
Wichterman, Ralph	68
v. Wicklen, Jane Hogan	32
Wilmoth, James H.	58, 59
Wolfson, Fruma	14
Woodhead, Arthur E.	21
Wright, Willard H.	28
Young, Martin D.	25
Young, Viola Mae	2
Zimmerman, Harry E., Jr.	24

ABSTRACTS

1. *Comparison of Methods Used for the Detection of* Endamoeba histolytica. Oscar Felsenfeld, Mount Sinai Medical Research Foundation, Chicago.

317 diarrheic stools were examined with the aid of direct smears, suspensions treated with D'Antoni's iodine, Quenzel's stain, zinc flotation, cultivation in Locke-egg-serum and liver-serum, and permanent hematoxylin-stained slides.

103 stools were found to contain *Endamoeba histolytica*. The probability of the detection of this protozoön was 0.41 using direct smears and D'Antoni's iodine; 0.43 with Quenzel's stain; 0.66 in culture; 0.88 with hematoxylin-stained slides and 0.93 using zinc flotation. In stools containing many cellular elements, e.g., proctoscopic specimens, the probability of a positive result using hematoxylin-stained slides increased to 0.91 and that of zinc flotation decreased to 0.81. Because of the easy preparation of hematoxylin-stained slides and their permanent value, this method is recommended for general use, supplemented by zinc flotation in cases showing no amoebas or cysts upon examination of permanent slides.

2. *The Staining of Protozoa in Formolized Stool Specimens.* Viola Mae Young, Mount Sinai Medical Research Foundation, Chicago.

The preservation of stool specimens with 10 per cent formalin holds forth much promise as an aid when parasitologic examination cannot be immediately performed. Such specimens can be used for direct examination and salt flotation. Degenerative forms of protozoa, however, require a hematoxylin stain for reliable diagnosis. Heretofore means of staining formolized intestinal protozoa have not proved satisfactory. In order to surmount this technical gap, the hematoxylin stains of Heidenhain, Delafield, Harris, Weigert, and Mallory followed by differentiating methods of Johnson, van Gieson, and Ratcliffe were investigated. It was found that the most reliable results were achieved by staining the specimens in bulk. Washing out of the fixative, staining, differentiation and dehydration are carried out by successive centrifuging, decanting and resuspending in the solutions to be employed. Mallory's phosphomolybdic hematoxylin for 18 to 24 hours followed by differentiation with distilled water gave the most satisfactory results. The stained specimens are finally treated with two successive changes of xylol and suspended in clarite. The latter suspension is mounted, using pressure on the coverslip during the drying process to avoid too much variation in depth.

3. *The Influence of Whole Egg Inoculum on the Growth of* Endamoeba histolytica-*organism* t *in Enriched Egg-White Medium and in Whole-Egg-Dialysate Medium.* Charles W. Rees, Lucy V. Reardon, Eleanor M. Johnson, and M. Frances Mayfield, National Institute of Health.

Egg-white medium enriched with 9 vitamins of the B group, cholesterol, and rice powder produced good growth of *Endamoeba histolytica*-organism *t* when inoculated from whole-egg medium but was deficient for amoeba-growth on serial transfer. The growth of organism *t* continued at a high level in serial transfer. Further enrichment of egg-white medium with casein hydrolysate and purine bases was without effect on the growth of the organisms. When inoculated from whole-egg medium good growth of *E. histolytica* occurred in loops of cellophane tubing containing rice powder and suspended in the overlay of whole-egg medium. As in the case of enriched egg-white medium the amoebae died out in serial transfer. The growth of organism *t* was not measured under these conditions. These data indicate that certain growth factors in egg white, egg yolk, and rice powder are essential for the growth of *E. histolytica* in the presence of organism *t*. The enrichment formulae added to egg-white medium failed to supply all of the missing yolk factors. The latter occur in whole-egg inoculum of *E. histolytica*-organism *t* but are absent in whole-egg dialysates of cultures of these two organisms.

4. *Pathogenicity of Pure Culture* Trichomonas gallinae *Orally Administered to Clean Pigeons.* Robert M. Stabler and Frank B. Engley, Jr., University of Pennsylvania.

The authors performed 42 implantations in studying the host-parasite relations of *T. gallinae* in birds from the senior author's loft of pigeons free of this pathogen. The material was obtained from a falcon (*Falco peregrinus anatum*) which died of infection with *T. gallinae*. Five types of inoculum were used: 1. Bacteria from the falcon's lesions (*Escherichia coli communis* and *Micrococcus candicans*); 2. Bacteria in the protozoan cultures from the falcon's lesions (the above plus *Bacillus subtilis*); 3. The protozoan culture (*T. gallinae* plus the bacteria in 2); 4. Cultures 1 and 3 in combination; 5. The falcon's *T. gallinae* in pure culture. In all experiments a 1-cc suspension of fresh inoculum was merely dropped by pipette into the back of the pigeon's open mouth. No injections were given. Of the 12 birds receiving bacteria alone none was affected; of the 17 receiving pure culture *T. gallinae* 15 died, 2 were used for other purposes;

in the 13 receiving *T. gallinae* and bacteria the lesions were no different in extent or kind from those receiving *T. gallinae* alone. Of the total of 30 birds given *T. gallinae* 4 were sacrificed for study and 26 ran a natural course. Of these latter, 21 died and 5 recovered. Lesions appeared in the mouth in 5.1 days (average). They were common in the mouth, oesophagus, lower crop, and liver. Variously involved were intestinal surface, pancreas, heart, air sacs, the bone of the floor of the skull, and the tissues of the eye. Death occurred in 9.8 days (average).

5. *Further Studies on the Inoculations of* Trichomonas foetus *(Protozoa) in Heifers.* Banner Bill Morgan, University of Wisconsin.

In a previous work, 9 heifers were injected intramuscularly or intravenously with 5 ml of living, washed, bacteria-free *Trichomonas foetus* approximately twice per week for a period of 3 months. These animals were apparently protected against bovine trichomoniasis as they could not be infected by way of the genital tract. Nine controls developed various manifestations of the disease. Further studies were continued using 20 virgin heifers (10 test animals and 10 controls). Two injections of 5 ml each of living trichomonads (50 million organisms per ml) were given during a period of 3 weeks. Immobilization of the trichomonads in dilutions ranging from 1 : 4 to 1 : 8 was observed in the sera of these heifers. At the first heat period after the last injection each cow was artificially inseminated with fresh normal semen. Twenty-four hours later all cows were inoculated in each uterine horn with 10 ml of motile *T. foetus* with 10 million organisms per ml. Ten control heifers were not vaccinated. Of the 10 vaccinated cows 8 showed heavy trichomonad infections and only 2 became pregnant. In the control group 4 animals were positive for *T. foetus* and 7 became pregnant. The results demonstrated that 2 intramuscular injections of *T. foetus* within a period of 3 weeks were not sufficient for protection against bovine trichomoniasis.

6. *Toxicity of Cecal Cores from Chickens Infected with the Protozoan,* Eimeria tenella. Mary Jane Bradford and C. A. Herrick, University of Wisconsin.

It was found that the blood and cellular debris from the cecal hemorrhage caused by *Eimeria tenella* produced intravascular coagulation and death in chickens when injected intravenously. This thromboplastic effect was apparently limited by the appearance of blood in the cecal material, since saline extracts of the contents present from the first to the fourth day after infection caused no inravascular coagulation and were lethal in only five out of twenty chickens. The injection of these extracts and ones from normal cecal contents caused regurgitation and weakening, but ordinarily the chickens recovered. On the other hand, similar extracts of the bloody material which appeared after the cecal cells were ruptured on the 5th day were invariably fatal within one minute after intravenous injection. Extracts of the cores formed on the 6th and those that were retained until the 13th day were similarly fatal. If chickens were autopsied immediately, large clots were found in the veins and heart.

This thromboplastic effect could be neutralized by an anti-serum developed in rabbit against chicken cecal mucosa.

It is suggested that, since thromboplastic material may be absorbed from the cite of tissue injury, it may account, at least in part, for the death resulting from cecal coccidiosis.

7. *Dosage of* Eimeria stiedae *Related to Severity of Liver Coccidiosis.* H. A. Jankiewicz, College of Osteopathic Physicians and Surgeons, Los Angeles.

Male domestic rabbits 9 weeks old, 3 to a group, were given each 0, 100, 1,000, 10,000 or 100,000 sporulated oöcysts. Twenty-two days later the rabbits were autopsied. When the total weight of the livers of each group was calculated as the percentage of total body weight for that group, the respective percentages for the dosages were 3.6, 4.3, 7.5, 11.7 and 16.0. In one rabbit of the 100,000 group the liver constituted 20.5% of its body weight. Correlated with the relative increase of liver size and weight, there was a corresponding increase of the number of gross lesions of the bile ducts and a decrease of normal liver tissue visible on the surface. The enormous increase in the amount of biliary epithelium and the proliferation of new bile ducts primarily caused the enlargement of the liver.

Beginning with the 100 dosage, the percentage of normal sporulation of oöcysts secured from the bile of the gall bladders was respectively: 76, 65, 43 and 14. Therefore lightly infected livers are a better source of normal oöcysts than are heavily infected ones. The oöcysts first appeared in the feces 16 to 17 days after the date of inoculation. By the twenty-second day the schizogony phase has nearly been completed; most of the coccidia are undergoing gametogenesis or have reached the oöcyst stage.

8. *Cryptozoites and Metacryptozoites of* Plasmodium relictum *in Canaries and Pigeons.* Frederick Coulston and Clay G. Huff, University of Chicago.

Using the methods described recently (1944) by us for the demonstration of the development of sporozoites of *P. gallinaceum* into pre-erythrocytic stages, it was possible to prove the existence

of cryptozoites and metacryptozoites in *P. relictum* of canaries and pigeons. Four strains of *P. relictum* were used; namely, a newly isolated strain (1Q), Coatney's pigeon strain (1P) not transmissible by mosquitoes, Redmond's strain of 1P adapted to canaries (1P1) and transmissible by *Culex*, and Redmond's strain of 1P1 after mosquito passage (1P1–1) which does not produce erythrocytic infections in pigeons either by blood or sporozoite inoculation.

Pre-erythrocytic stages were demonstrated in the 1Q, 1P1, and 1P1–1 strains. These cryptozoites and metacryptozoites, although similar to *P. gallinaceum* in types of cells infected and rate of development from the sporozoite to cryptozoic segmenter, differ somewhat in morphological appearance. The merozoites are rounder instead of being pointed as in *P. gallinaceum* and there are fewer per segmenter. Often individual parasites stain pink rather than blue, a phenomenon never observed in *P. gallinaceum*.

Of special interest is the fact that cryptozoites, metacryptozoites and erythrocytic stages were found in canaries infected with sporozoites of strains 1P1 and 1P1–1 of *P. relictum* but only pre-erythrocytic stages could be demonstrated in the pigeon. However, upon subinoculation of blood from infected pigeons to canaries, many of the canaries developed typical parasitemia thus proving the existence of subpatent infections in the pigeons. (Work done under contract with the Office of Scientific Research and Development.)

9. Plasmodium circumflexum *in the Ruffed Grouse in Ontario.* A. Murray Fallis, Ontario Research Foundation, Toronto.

A species of plasmodium which was discovered in the ruffed grouse in Ontario appears to be a strain of *P. circumflexum*, although, when studied in the grouse only, it had characters midway between those of *P. lophurae* and *P. circumflexum*. It has been transferred to grouse, canaries, turkeys, and ducks. There was no indication that it was pathogenic to any of these birds. Development occurred more readily in grouse than any of the above-mentioned birds. Parasites were present in the peripheral blood of a grouse for at least 8 months following infection. The infection was observed from 2 to 15 days in canaries with the exception of one in which it remained for 40 days. It appeared in the peripheral circulation in one of the ducks for 6 days and in the turkeys for 2 days only. Infections in the grouse reached higher parasite levels than in the other birds. No well-defined periodicity or synchronicity was observed.

The variations in the morphology and behavior of the parasite which occur following repeated transfers from canary to canary have been followed and the parasite has been compared with another strain of *P. circumflexum* and with *P. lophurae*.

10. *Studies on* Plasmodium gallinaceum *Brumpt. IV. Parasitemia and Survival in Blood-Induced Infections in Young Chicks.* W. Clark Cooper and G. Robert Coatney, National Institute of Health.

During 4 years of screening potential antimalarial drugs, over 22,000 week-old White Rock chicks maintained on a formulated stock diet were given standard intravenous inoculations of 16×10^6 red blood cells containing *Plasmodium gallinaceum*. Of these, 2,000 were untreated controls. The basic data used for drug appraisal (4th-day-parasitemia and survival) have been analyzed. In the controls, 4th-day parasitemia averaged 5,440 parasitized red blood cells per 10,000. Over 99% of these control birds died of the acute infection, the periods of survival showing a characteristic biphasic pattern, with frequency peaks at 6 and 17 days. Even after active drugs, mortality was only slightly decreased, though a greater proportion of deaths occurred in the late phase.

Data are also presented from a smaller series to show the variations that occur even with standardized procedure and the use of a single suspension of parasitized cells; results in another series show the effect of varying the size of the inoculum, by serial dilution, from 10^8 to 10^{-1} parasitized red cells. (Work done under contract with the Office of Scientific Research and Development.)

11. *Studies on* Plasmodium gallinaceum *Brumpt. VI. A Study of the Pathology in Young Chicks.* Lloyd R. Hershberger and G. Robert Coatney, National Institute of Health.

A lot of 130 week-old White Rock chicks were each given 16×10^6 red cells parasitized by *P. gallinaceum* and then killed in numerical order on the 2, 4, 5, 6, 7, 8, 10, 12 and 14th day after inoculation for a study of the progressive histopathology correlated with the general course of the disease. Data are also presented on the physiochemical characteristics of the pigment.

Parallel data are presented from a similar lot of chicks each given "one mosquito equivalent" of sporozoites subcutaneously and then killed in numerical order. (Work done under contract with the Office of Scientific Research and Development.)

12. In vitro *Studies on Malarial Sporozoites.* Richard J. Porter, Raymond L. Laird, and Elizabeth Dusseau, University of Michigan.

The increasing laboratory use of mosquito-induced malarias demands reliable procedures for

infecting experimental animals with sporozoites. To this end, various methods of introducing *Plasmodium gallinaceum* sporozoites into chickens have been evaluated.

Data are reported concerning methods of immobilizing mosquitoes for dissection, media and temperatures for suspension of infected salivary glands, techniques for estimating sporozoite dosage, and routes of inoculation of sporozoite suspensions into chickens. On the basis of these data, the following procedure is recommended: Infected mosquitoes are killed with cigarette smoke. The salivary glands are removed in normal saline and ground in a roller mill containing heparinized normal chicken blood. The concentration of sporozoites is estimated from stained dry smears of this suspension. The suspension is diluted with normal saline solution and inoculated intravenously. (The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Michigan.)

13. *Observations on the Courses of Infection in Sporozoite-Induced* Plasmodium cynomolgi *Malaria.* Raymond L. Laird and Richard J. Porter, University of Michigan.

In order to test drugs for possible curative action against malaria, it seemed desirable to accumulate a large series of sporozoite-infected test animals. *Plasmodium cynomolgi* was selected as an experimental organism because in some respests it apparently is similar to *Plasmodium vivax*, and it can be transmitted through laboratory strains of *Anopheles quadrimaculatus.*

In the observations reported in this paper, *Anopheles quadrimaculatus* were infected by feeding on infected monkeys. After a suitable incubation period, the salivary glands were dissected from the mosquitoes and suspended in monkey serum or heparinized monkey blood. This suspension was then ground in a roller mill, diluted with serum and saline, and inoculated into the monkeys intravenously. Observations were then made concerning the prepatent period, patent period, and relapse rate in treated and untreated infections. (The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Michigan.)

14. Plasmodium elongatum *in Pekin Ducks.* Fruma Wolfson, Johns Hopkins University.

P. elongatum was reintroduced into the duck in order to make it available for chemotherapy research. The present strain is designated as "5 E" and is different from the one previously studied in the duck.

The parasite was inoculated into the duck from a canary and was subsequently passed through 40 consecutive semi-weekly intravenous subinoculations. A total of approximately 130 birds was used. Eighty of these were studied throughout the patent period of infection. Judging from observations of the peripheral blood, rapid passage through the duck did not raise the degree of parasitemia. The percentage of parasitized erythrocytes was usually under 10 at the peak of infection, which occurred on the third day after inoculation with 3 billion parasites per kilogram of duck weight. In the surviving birds this peak was followed by the second one—sometimes as high as the first. Of 80 birds inoculated with doses up to 3 billion parasites 74% died during the first two weeks after inoculation. Deaths were apparently due to rapidly developing anemia. The RBC count dropped from over 2.5 million per cu mm before inoculation to less than 0.5 million six days after inoculation. Such severe anemia was probably caused by the large numbers of parasites found in locations other than peripheral blood, particularly bone marrow. The erythrocytes or their precursors were probably destroyed before they had a chance to enter the peripheral circulation. In spite of an abundance of gametocytes, attempts to infect *Culex pipiens* thus far have failed. The parasite was successfully preserved by low temperature freezing. (This work was done under contract with the Office of Scientific Research and Development.)

15. *The Relations between Pantothenic Acid and* Plasmodium gallinaceum *Infections of the Chicken.* Sterling Brackett and Emanuel Waletzky, American Cyanamid Company, Stamford, Connecticut.

The course of blood-induced *Plasmodium gallinaceum* infections in the chicken is greatly altered when the host is maintained on a diet deficient in pantothenic acid. When relatively small inocula of parasitized erythrocytes are used, peak parasitemia is much lower in pantothenic acid deficient birds than in birds on a supplemented diet, and the average number of merozoites per schizont is reduced in the deficient birds. This suggests that the malaria parasite requires pantothenic acid. However, the course of sporozoite-induced infections is not materially altered by a pantothenic acid deficiency. Similarly some analogues of pantothenic acid, when administered in the diet, are highly effective in suppressing blood-induced infections, but do not suppress sporozoite-induced infections. This refractory behavior of sporozoite-induced infections may be associated with the predominantly non-erythrocytic development of the parasites in the early part of such infections, and the comparatively high concenrations of pantothenic acid in tissues

other than blood, rather than with a difference in the pantothenic acid requirements of the erythrocytic and the various exoerythrocytic stages of the malaria parasite.

16. *The Relative Activity of Sulfanilamides and Other Compounds in* Eimeria tenella *Infections of the Chicken.* Emanuel Waletzky and Carrie Ola Hughes, American Cyanamid Company, Stamford, Connecticut.

The activity of sulfaguanidine in *Eimeria tenella* infections of the chicken was strikingly surpassed by only a few of the forty-five other sulfanilamides tested, namely: the halogenated sulfapyrimidines, sulfamethazine, and sulfapyrazine which were respectively about ten, five and four times as active as sulfaguanidine on a dosage basis. The activity of sulfanilamides in coccidiosis resembles that in other infections since it is antagonized by para amino benzoic acid, and is dependent upon the presence of a free amino group in the para position of the benzene ring. Since there is some correlation between the activity of sulfanilamides in the coccidiosis and the malaria of the chicken, some thirty-nine other sulfanilamides which show only slight antimalarial activity in the chicken are probably not promising coccidiostatic agents. No correlation between antimalarial and anticoccidial activity exists in other types of compounds since such potent antimalarials as quinine, atabrin, and plasmochin are inactive against coccidiosis. Poorly absorbed sulfanilamides showed little or no anticoccidial activity, and the effect of active sulfanilamides paralleled their blood concentrations. This may be related to the slow rate of action of the sulfanilamides and the brief duration of the extracellular stages of the coccidia. Some of the sulfanilamides which are superior to sulfaguanidine in avian coccidiosis may be even more strikingly superior in mammalian coccidiosis since sulfaguanidine maintains much higher blood concentrations in birds than in mammals.

17. *Aspects in the Control of Intestinal Coccidiosis in Commercial Rabbitries by the Use of Phthalylsulfathiazole.* Everett E. Lund, United States Rabbit Experiment Station, Fontana, California.

Phthalylsulfathiazole has been used in doses averaging 0.20 to 0.25 grains per pound of body weight per day, in an effort to develop an economically practical means of controlling intestinal coccidiosis in commercial rabbitries. In addition to varying the time and manner of administering the drug, it has been used on animals of various ages, animals with varying degrees of active acquired immunity, and on animals with experimentally produced infections with both fresh and "time-attenuated" strains.

Determination of the effectiveness of the drug under the various circumstances was based on suppression of oöcysts capable of sporulation, gross pathology, weight changes, ability to produce and rear litters, and on dressing percentages.

Most tests dealt with infections with *Eimeria magna.* Random observations of the effects on other forms were recorded, and comparison to the use of succinylsulfathiazole in some instances was indicated.

18. *Chemical Studies on Egg-White Medium for the Cultivation of* Endamoeba histolytica. Theodor von Brand, Charles W. Rees, Lucy V. Reardon, and William F. Simpson, Catholic University of America and National Institute of Health.

A diphasic medium dispensed in Florence flasks of 250-ml capacity as used for the cultivation of *Endamoeba histolytica,* consisting of a base of 50 ml of inspissated egg white with 3 gm of powdered egg shell, and an overlay of 200 ml of Locke's solution, was stored for periods up to 20 days and analyzed for reducing substances, fats, and nitrogenous compounds. The rates of diffusion were measured in the overlay and the results compared with analyses of egg-white emulsion. Diffusion of reducing substances was rapid, nearing completion after 2 days and 8 days at 37° C and 10° C, respectively. Diffusion of nitrogenous compounds was considerably slower and it had not reached a standstill at 20 days, although it was most rapid during the first 8 days. Only a trace of fats was demonstrable in the overlay and there was no evidence of diffusion. The reducing substances were composed primarily of glucose. The nitrogenous material was calculated as ovomucoid which is the only egg-white protein not coagulable by heat. Some of the reducing substances appeared to be indiffusible. Curves were plotted for standardization of medium for the cultivation of *E. histolytica.*

To determine the extent of spontaneous oxidaions of the medium, air was confined over the base, with and without overlay, and analyzed for oxygen content after designated periods of storage. A decrease of oxygen occurred in the amount of 1 ml per 125 ml of air but no corresponding decrease in air over Locke's solution or in air-filled flasks was observed. The data are in agreement with a theory that components of egg white contributing to the growth of E. *histolytica* may be rendered inactive by oxidation. There was some increase of carbon dioxide content of air over the medium but comparative figures showed no consistent trends.

19. *Hexenolactone, an Effective Inhibitor of* Trypanosoma cruzi *Growth* in vitro, *but not* in vivo. Theodore S. Hauschka, N. du Bose Maxwell, and Eleanor M. Johnson, Lankenau Hospital Research Institute and National Institute of Health.

Hexenolactone (parasorbic acid) occurs as a natural growth-inhibitor in various plants and its synthetic equivalent has been shown to interfere with cellular multiplication in several bacteria, yeasts and animal tissues. Fourteen experiments involving five concentrations of the lactone (M/50,000, M/10,000, M/2000, M/1000 and M/600, the last being equivalent to a near-toxic concentration in mammals) and two culture media at like pH and temperature showed from partial inhibition to inactivation and death of *Trypanosoma cruzi* (Culbertson strain). Haemocytometer counts of the trypanosomes, occasionally checked by photo-electric turbidity comparisons, were made at regular intervals. A representative series of results with M/2000 hexenolactone follows: After 6 days of growth the tests showed under 1000 trypanosomes per cubic millimeter, the control counts were 34,000 35,000, 49,000. There was no test increase after 10 days, while the control counts had risen to 92,000, 96,000 and 99,000. After 20 days the picture was similar, but there were still some viable trypanosomes in the tests, as demonstrated by transfers to normal medium. The two higher concentrations tested killed the organisms after 4–10 days exposure.

Experiments on 76 rats and mice, infected with *T. cruzi* or *T. equiperdum* and injected either intraperitoneally or intravenously with near-toxic amounts of hexenolactone, gave no trypanocidal results of clinical significance. This discrepancy between *in vitro* and *in vivo* effects is in keeping with the sulfhydryl-conditioned inhibitory mechanism of hexenolactone (Hauschka, Toennies and Swain, 1945, Science **101**: 283–285, reduced sulfhydryl compounds being constantly replenished in the living host, but not in culture media.

20. *Studies on* Plasmodium gallinaceum *Brumpt. V. Quinine Standardization in Screening Tests Against Blood-Induced Infections in Young Chicks.* G. Robert Coatney and W. Clark Cooper, National Institute of Health.

Quinine was used as a standard in quantitative appraisal of suppressive activity against blood-induced *P. gallinaceum* infections in week-old White Rock chicks. Each bird received medication by mouth twice daily for 4 days with intravenous inoculation of 16×10^6 parasitized red cells approximately 6 hours after the first dose of drug. The evaluation of activity was based on the average parasite count in the 5 birds constituting a test group, on the morning after last medication. The smallest dosage which reduced the average 4th day parasitemia to 25% or less of that in the controls was considered the minimum effective dosage.

Data are presented to show that the minimum effective dosage of quinine base is approximately 0.016 mg/g. A series of 220 birds inoculated from a single suspension is presented, in which 55 birds were given 0.016 mg/g of quinine base, 55 were given 0.008 mg/g, and 110 served as untreated controls; the variations in parasitemia at threshold dosages are shown.

Two quinine-treated groups, given 0.016 and 0.008 mg/g respectively, were included as controls in routine drug series. Data on approximately 1000 such quinine-treated birds in 100 consecutive drug series, are analyzed. In nearly 90% of the series the higher dosage was effective, the lower was not. Data on the minimum effective dosages of quinacrine (atabrine) and plasmochin under similar conditions are included for comparison. (Work done under contract with the Office of Scientific Research and Development.)

21. *The Life-History Cycle of* Dioctophyma renale, *the Giant Kidney Worm of Man and Many Other Mammals.* Arthur E. Woodhead, University of Michigan.

Eggs when incubated at room temperature for six months contain infective larvae. The larva hatches after a few minutes in the fore-gut of branchiobdellids which are parasitic on crayfish. Penetration into the body-cavity follows in about ten minutes and the larva soon comes to rest in various organs or tissues. About ten days are required to transform into a shorter, gordius-like larva. A cyst is formed which is easily confused with the cyst of the Gordiacea.

The northern black bullhead, *Ameiurus melas melas,* eats branchiobdellids from the bottom or consumes the branchiobdellid-laden exuviae of crayfish. The excysted larva migrates to the mesenteries and again encysts. The larva then undergoes extensive linear growth similar to the growth of *Paragordius varius* in crickets. The head of the second stage larva shrivels and a new third stage (or final) head and characters of the final adult become apparent.

Two ferrets were fed bullheads collected in July from an infected area. This feeding resulted in the death of one ferret four weeks later, from which a 30-mm *D. renale* female was recovered, and the illness of the second which is alive as of November 15. Sectioned mesenteries from this and later collections of bullheads showed many *D. renale* cysts in all stages of development. A 10-mm male *D. renale* was recovered from a cyst in the mesentery over the stomach of a bullhead.

Bullheads become infected coincident with the molting of crayfish.

Two years are required to complete the life-cycle from egg to adult.

22. *Epidemiological Investigations on Filariaris on Certain Islands of the South Pacific Area.* ELON E. BYRD, University of Georgia.

From epidemiological studies on filariaris in the South Pacific Area it is shown that rarely are the microfilariae (*Wuchereria bancrofti*) found in the circulating blood of children under three years of age. Between the 3rd and 15th years of life the incidence of infection ranges around 5 per cent for the Polynese and 10 per cent for the Melanese children. The incidence of blood microfilariae more than doubles this level in the age group 16 to 20 years, and this per cent level steadily increases for both groups until more than 40 per cent of those individuals 50 years of age and over can be demonstrated (single smear method) to harbor the filaria larvae. There is a corresponding higher incidence of microfilaria-positive blood in all age groups in the Melanesian race than can be shown for the Polynesian. It is impossible to say whether this higher incidence level is due to race, species of parasite, physiology, or transmitting host. However, it is known that the aperiodic filaria occurs throughout Polynesia and that a periodic form parasitizes the Melanesian population. The aperiodic filaria is transmitted by *Aedes pseudoscutellaris,* a day feeding mosquito; while the periodic form is transmitted by a night feeding species, *Anopheles farauti.* Through field studies it was possible to demonstrate that up to 35 per cent of *A. pseudoscutellaris* from isolated village areas harbored developing filaria larvae, and in one village more than 80 per cent of *Anopheles farauti* carried these forms. Some evidence was obtained in Polynesia which indicated the rate of transmission was seasonal. Cross-infection experiments indicated that the transmission of filariaris is strictly a concern of the local species of mosquitoes, and that, although several species may be capable of completing the developmental cycle of the parasite, rarely can more than one or two species be demonstrated to be principal vectors within a given endemic area.

23. *Studies in Filariasis. II. A Skin Test for Filariasis* bancrofti *Utilizing Antigen Prepared from Microfilariae of* Wuchereria bancrofti. GEORGE W. HUNTER, III, JOHN BOZICEVICH, AND VIRGINIA G. WARREN, Army Medical School and National Institute of Health.

Sixty-five patients suspected of having filariasis were inoculated intradermally with antigens prepared from microfilariae of *Wuchereria bancrofti* and the adult dog heart worm, *Dirofilaria immitis.* In order to establish the optimum dilution for the *Wuchereria bancrofti* antigen, patients were inoculated with 1:1000, 1:4000, 1:8000, 1:12,000, and 1:16,000 and 1:20,000 dilutions of the material. These results were compared with those elicited by the *Dirofilaria immitis* antigen, the optimum dilution of which previously had been found to be 1:8000. In this series the *bancrofti* preparation appeared to be at least as sensitive as the *immitis* antigen, and probably the more specific.

In a control group of 33 non-allergic individuals which had never been exposed to filariasis, none reacted to the new antigen made from mf of *Wuchereria bancrofti,* and only four false positive reactions were encountered. No false positive responses occurred in 21 enlisted men harboring one or more of the following parasites: *Strongyloides stercoralis, Ascaris lumbricoides,* hookworm, *Hymenolepis nana* and *S. japonicum.* This specificity exhibited by the *bancrofti* antigen would certainly serve to enhance its value as a diagnostic aid in the diagnosis of filariasis.

24. *The Biological Status of* Sarcocystis. L. A. SPINDLER AND HARRY E. ZIMMERMAN, JR., U. S. Bureau of Animal Industry.

The biological status of parasites comprising the genus *Sarcocystis* has been somewhat in doubt. An investigation on the species infecting swine showed that this parasite is a fungus and not a protozoan as commonly supposed. The main points of the investigation are as follows:

Sarcocysts or Miescher's sacs, removed aseptically from the muscles of swine, were ruptured in sterile dextrose culture solution to release the spores; the preparations were cultured at 37° C for 24 hours and subsequently at room temperature. After a few days to two weeks of culturing, the spores budded off minute coccoid bodies which developed, by incomplete budding, into a septate mycelium with vertical hyphae bearing spores. The fungus has been identified as *Aspergillus* sp.

Twenty-five of 50 young pigs injected with, or fed, conidia harvested from the cultures harbored at necropsy, 4 to 6 months after infection, typical sarcocysts in the muscles; controls escaped infection. Cultures made from the mature sarcocysts yielded a fungus like that injected.

Pigs, rats, and mice, fed sarcocysts, discharged with their urine and feces yeast-like bodies which, in culture, produced a fungus like that originally cultured from sarcocysts. Sections of kidneys of infected mice showed yeast-like bodies in the tubules. In rats and mice clumps of a fungus were found attached to the walls of the ileum and cecum; yeast-like bodies similar to those found in feces and urine budded from the internal walls of this fungal growth.

25. *Studies on Imported Malarias: 4. The Infectivity of Foreign Malarias to Anophelines of the Southern United States.* MARTIN D. YOUNG, TRAWICK H. STUBBS, JOHN M. ELLIS, ROBERT W. BURGESS, AND DON E. EYLES, U. S. Public Health Service.

The infectivity of foreign malarias relapsing in returned soldiers to anophelines of the

Southern United States was investigated. A total of 173 lots of *Anopheles quadrimaculatus* was fed upon *Plasmodium vivax* relapsing in soldiers. The origins of the infections were: South Pacific—117; Mediterranean—40; Carribean—6; Liberia—1; Burma—1.

Malarias from each of the above areas infected *A. quadrimaculatus*. The rate of infection in the total 6,247 mosquitoes dissected was 30.8 per cent.

A. quadrimaculatus successfully transmitted these infections to man. These foreign malarias induced in neurosyphilitic patients were also infective to *A. quadrimaculatus*, and continued to be through several serial transfers both by mosquitoes and blood inoculations.

Gametocytes were produced and mosquitoes were infected as long as relapses occurred. The case with the most relapses (24) and the case with the longest duration of the disease (31 months) both infected mosquitoes.

The average length of the sporogonous cycle of *P. vivax* in *A. quadrimaculatus* was 10.7 days when incubated at 74–80° F.

Mosquitoes kept at outdoor temperatures in Texas during April and May developed infections at about the same rate as those kept in the insectary.

A. puncipennis, A. p. pseudopunctipennis and *A. albimanus* also became infected by the foreign malarias.

The foreign malarias studied readily infected *A. quadrimaculatus* and were transmitted by this vector.

26. *Vectors of Scrub Typhus.* G. W. Wharton, U. S. Naval Medical Research Unit No. 2 and Duke University.

Trombiculid mites have long been recognized as vectors of scrub typhus or tsutsugamushi fever. There are well over a hundred species of the family Trombiculida reported from the areas in Australia, Asia, and the islands of the Pacific where the disease occurs in man. The mites that have been demonstrated to carry the disease all belong to the genus Trombicula *sensu strictu* and all are characterized in the larval (chigger) stage by having feathered rather than nude galeal setae; a nude seta on papal segment two; a nude seta on papal segment three; and a feathered dorsal, nude lateral, and nude ventral seta on papal segment four. At least one species of mite with the above characteristics has been found associated with scrub typhus in Japan, Formosa, Pescadores Islands, Malaya, Sumatra, India, New Guinea, Australia, Philippine Islands, and the Solomon Islands. No larval trombiculids with the above characteristics were found in areas in the Solomon Islands, Ryukyu Islands, Guam, Iwo Jima, Ulithi, and Peleliu where scrub typhus is not known to occur. It therefore seems probable that mites of the genus Trombicula that possess the morphological features described above play the part in transmission of scrub typhus that belongs to the anopheline mosquitoes in the transmission of malaria. The following names have been used for the eastern species of mites that have the above characteristics: *Trombicula akamushi, T. pallida, T. palpalis, T. scutellaris, T. intermedia, T. keukenschrijveri, T. fletcheri, T. obscura, T. deliensis,* and *T. walchi.*

27. *Laboratory Studies on the Snail of* Schistosoma mansoni. Eloise B. Cram and Virginia S. Files, National Institute of Health.

Using the Puerto Rican strain of *Schistosoma mansoni* and its known intermediate host, *Australorbis glabratus,* as a control, additional attempts have been made to infect snails native to the United Staes including members of the genera *Gyraulus, Helisoma, Planorbarius, Planorbula* and *Tropicorbis.* In a species of *Tropicorbis* originating from Louisiana sporocysts and cercariae developed. The cercariae proved infective for mice, causing lesions attendant to the development of the adult worms and the dispersal of ova comparable to those produced in controls with cercariae from *A. glabratus.* Cercarial production was continued in *Tropicorbis* for as long as 107 days, the daily output increasing as time went on, resulting in the death of the snail. A relatively small percentage of this species of snail proved susceptible to infection. A series of experiments was conducted to test the effect of various techniques of exposure, taking into consideration such factors as the species of mammalian host from which ova were derived, the age and size of the snail, whether laboratory reared or "wild," individual or mass exposures, and the effect of previous exposures.

28. *A Group Research Project on Biological Phases of* Schistosoma japonicum *and* S. mansoni *infections.* Willard H. Wright, National Institute of Health.

Field observations made by the writer in the Philippine Islands were coördinated with laboratory studies made by other members of the staff at the Zoölogy Laboratory, National Institute of Health. Snails and mammals infected with *S. japonicum* were supplied by the Office of the Surgeon General, U. S. Army, and comparable *S. mansoni* material had been provided earlier by the School of Tropical Medicine, San Juan, Puerto Rico. To meet the immediate

practical need for information as to anticercarial treatment of water to be used for drinking and bathing, tests were made on mechanical removal of cercariae by filtration and on killing by chlorination. Preliminary studies were made on the effectiveness of chlorination of sewage in killing ova and miracidia. For evaluating measures for preventing skin penetration, chemically impregnated fabrics and ointments were tested. Laboratory colonies of the Philippine snail host, *Schistosomophora quadrasi,* were established and critical observations were made on environmental factors of significance in the breeding of these snails and of *Australorbis glabratus.* American snails which were regarded with suspicion as possible potential *S. japonicum* vectors were collected and identified, established as laboratory colonies, and tested as to their susceptibility to infection by tests similar to those already reported for *S. mansoni.* Various methods of preparing antigens of the two species of schistosomes were critically evaluated.

29. *The Making of a Parasitologist.* Asa C. Chandler. Rice Institute. Presidential Address.

30. *Sarcocystis in the Monkey. A Report of Two Cases.* Edward P. Offutt, Jr. and Ira R. Telford, University of Rochester and George Washington University.

In the course of the histological examination of tissue from six *Macacus rhesus* monkeys (Rochester colony) suffering from "cage paralysis," the presence in two of basophilic, granular, intramuscular-fiber inclusions was noted by one of us (I.R.T.). These structures were subsequently examined by the senior demonstrator and diagnosed as *Sarcocystis sp.*

It is not to be inferred that the "cage paralysis" necessarily resulted from the presence of the parasite. A further survey of this infection is now in progress.

The reported infrequent finding of this parasite in the monkey has led us to present this demonstration. Various sections of tissue, photographs, and charts pertaining to the infected animals have been made available for examination, along with certain other hosts parasitized by *Sarcocystis sp.* that have been encountered in the past in the laboratory at Rochester.

31. *Liver Coccidiosis Prevented by Sulfasuxidine.* H. A. Jankiewicz, College of Osteopathic Physicians and Surgeons, Los Angeles.

Eight weaned rabbits weighing from 3.5 to 5 pounds each consumed daily for 13 days about 0.625 grams of sulfasuxidine mixed in their feed. The average daily dose for the following 19 days was 0.75 grams. These rabbits each received 200,000 oöcysts of *Eimeria stiedae* on the day after the 0.75 gram dosage was instituted. Four controls not given sulfa were given a similar number of oöcysts; four others remained as non-infected controls. Eighteen days after the inoculation date, all rabbits were autopsied.

Grossly and microscopically the livers of the sulfa-fed rabbits appeared free from infection. No oöcysts were present in their gall bladders. However, the average liver of the sulfa-fed rabbit constituted 4.7% of the body weight compared to 3.7% for the uninoculated controls. The parenchymal cells appeared swollen and abnormal. Each inoculated control had a great number of typical biliary lesions and the average liver constituted 8.0% of the body weight.

The dosage of sulfasuxidine used did prevent the disease but appeared to be moderately toxic when given for a period of 32 consecutive days.

32. *A New Species of* Opecoeloides *(Trematoda: Opecoelidae) from the Threadfin Fish,* Polynemus octonemus. Jane Hogan von Wicklen, University of Nebraska.

A new species of *Opecoeloides* is characterized by the peculiar arrangement of the ten acetabular papillae. Its study led to a revision of related species. Linton evidently placed too little significance on acetabular papillae in this group. Study of the type specimen of *Distomum vitellosum* Linton, 1900 shows that it belongs in the genus *Opecoeloides;* that it is different from *Cymbephallus vitellosus* Linton, 1934 of Manter, 1934; and that *Opecoeloides manteri* (Hunninen and Cable, 1940) is one synonym. Various name changes are indicated in a paper now in press.

33. *Tumor Formation as a Reaction to* Litomosoides carinii, *a Filariid of the Cotton Rat.* J. Allen Scott and Joy Barnes Cross, University of Texas.

A wild cotton rat, *Sigmodon hispidus texianus,* presenting the appearances of advanced age, was killed three weeks after capture. The pleural cavity was found to contain only dead specimens of the filarial worm, *Litomosoides carinii.* In addition to worms lying free in the cavity, other dead worms extended through, or were coiled within three masses of tissue located in the superior mediastinum. Sections of these tumors show that the tissue reaction is primarily a typical inflammatory reaction with proliferation of connective tissue. The infiltration is composed for the most part of neutrophils which were scattered through the connective tissue, concentrated immediately around the worms, and to a slight extent invading the tissues of the worms.

Only occasional eosinophils are seen, and no multinucleate giant cells have been observed. About 15 per cent of the cells are histiocytes, both fixed and free, some of them containing nuclei of polymorphs. A large central area is filled primarily with disintegrating remnants of worms, worm eggs and a few polymorphs, but it does contain a few normal polymorphs and scattered connective tissue strands. Rarely small calcified areas are seen. Studies of related material from other animals indicate that these tumors are probably formed as a reaction to dead worms or possibly to worms which have been injured and have adhered to the tissues of the host.

34. *The Application of Cytological Techniques to Cestode and Other Helminth Material.* Arthur W. Jones and Helen L. Ward, University of Tennessee.

The chromosomes of cestodes can best be studied after fixation in suitable reagents, either in material sectioned at from 10 to 20 microns, or in flattened smear preparations. Sections may be stained with crystal violet, the Feulgen reagent, or iron haematoxylin. Smears may be stained with aceto-carmine or the Feulgen reagent. The chromosomes of trematodes and acanthocephala may be studied by similar methods.

35. *Preliminary Report on the Distribution of* Onchocerca cervipedis. Carlton M. Herman and Arthur I. Bischoff, California Division of Fish and Game.

This filariid nematode is a parasite of subcutaneous tissues of deer and possibly also occurs in prong-horn antelope and wapiti. In the past it has been reported primarily from western Montana. During the past two years the authors have examined one or more feet from about 330 deer from 16 counties in California. These included Rocky Mountain mule deer (*Odocoileus hemionus hemionus*), California mule deer (*Odocoileus hemionus californicus*), and black-tail deer (*Odocoileus hemionus columbianus*). Some specimens from all but three of these counties were positive. The worms apparently concentrate in greatest numbers under the skin about the hock joint of both fore and hind feet. Of 1220 feet examined, 447 were infected. Incidence varied from zero to 100 per cent in the deer from the areas sampled. In the three areas from which a large series was examined, incidence varied from 49 to 81 per cent. All worms collected were examined with the aid of a microscope. The worms were predominantly females. Examination of a number of entire fresh deer skins in the field revealed none of the worms although subsequent examination of the feet from some of these animals showed them to be infected. *Onchocerca cervipedis* has a wide distribution in deer in California. Examination of 200 feet from 52 prong-horn antelope (*Antilocarpa americana*) demonstrated no infection, although feet of deer from the same areas were positive.

36. *The Rate of Growth and Maturity of* Litomosoides carinii, *a Filariid of the Cotton Rat.* J. Allen Scott, University of Texas.

Experiments on the transmission of *Litomosoides carinii* have provided material for studies on the rate of growth and maturity of these filariids of the cotton rat. Worms as small as 870 μ have been found in the pleural cavity of the rats. Some of these smallest specimens have been recognized as males by the presence of a primordial cloaca. Females have been recognized by the presence of the vulva when as small as 2.0 mm. Since the infective larvae have been reported to vary from 800 to 1000 μ in length, it seems obvious that little or no growth takes place during the period of migration from the point of entrance into the definitive host to the final site. A moult from the fourth larval stage to the adult stage occurs when the worms of either sex are between 7 and 10 mm in length. Microfilariae were found in the circulating blood of rats 7 weeks old when they had been infected at an undetermined time, but presumably within a few days after birth. The male worms had sometimes completed half of their expected growth in length in rats 6 weeks old, while females reached this halfway mark in about 8 weeks. In wild-caught rats kept free from further infection for several months, the usual maximum length of male worms was 20 to 22 mm and of females 80 to 90 mm although a few females reached 100 mm. In the experimental rats some males reached 21 mm and some females 78 mm in as short a period as 10 weeks.

37. *Anatomical Studies on the Fourth Stage Larvae and Adults of* Litomosoides carinii, *a Filariid of the Cotton Rat.* Joy Barnes Cross and J. Allen Scott, University of Texas.

Out of 2000 available specimens of *Litomosoides carinii* from the Texas cotton rat, *Sigmodon hispidus texianus,* 200 have been selected for intensive study. Descriptions of the developmental patterns of the cuticular structures, the somatic musculature, and the digestive and reproductive systems are presented. The worms varied in length from about 1 mm to maximum sizes of 22 mm for the male and 100 mm for the female. A moult from the fourth larval stage to the adult stage occurs when the worms are between 7 and 10 mm in length. After removal from the host the mature females can be stimulated to discharge in some cases oviform and in others vermiform

larvae, while still others discharge both types. Artificially produced empty spaces have thus been left in the uterus. Moreover, the vaginae of the worms have been observed to contain one type of larvae or the other exclusively, or both types together. These variations and others seen in the normal histological picture point to the need for extreme care in interpreting histological changes occurring after the worms have been subjected to various drugs, and for a knowledge of the histological variation which can result from differences in methods of handling the worms at autopsy. In addition, there is commonly a great difference in the degree of development of the two branches of the ovary or uterus at the same level in the worm, as well as similar variations between homologous regions in different worms of the same length.

38. *Treatment of Canine Filariasis with Trivalent Arsenicals (p-arsenosobenzamides).* G. F. Otto and Thomas H. Maren, Johns Hopkins University.

Preliminary studies with microfilaria of *Dirofilaria immitis* showed that the phenyl arsenoxides were 10 to 400 times as toxic as the trivalent antimonials for these organisms *in vitro*. Subsequent studies on cotton rats showed that of these phenyl arsenoxides the p-amide substituted compounds regularly killed all adult *Litomosoides carinii* and were well tolerated by the host. Of these amides p-arsenosobenzamide (T.D.C. #622) itself was extensively studied in the dog and was shown to kill all the adults of *D. immitis* in doses as low as 0.45 mgm As/K daily for six weeks. Because of the low solubility in water, work with this compound was discontinued and one of its more soluble thio-arsenites, p-$CONH_2$ $As(SCH_2COOH)_2$, was synthesized. The neutral sodium salt of this compound has been shown, to date, to kill all adults of *D. immitis* in doses of 0.45 mgm As/K daily for 15 days. Neither p-arsenosobenzamide or the thio-arsenite seems to have any direct killing action on the microfilaria *in vivo* in doses of 0.9 mgm As/K for 30 days despite the fact that *in vitro* all microfilaria were killed in 22 hours in dilutions as low as 1 : 800,000 (in terms of arsenic). Apparently after the death of the adult worms the microfilaria die slowly without appreciable ill effects from the arsenic. One dog treated with 0.45 mgm As/K daily for 50 days maintained an undiminished microfilaria blood level for 100 days thereafter; now, 200 days after the end of treatment, the microfilaria count has dropped to less than one-fifth of the pretreatment level. (This work was done under contract with the Office of Scientific Research and Development.)

39. *The Treatment of Human Filariasis* (Wuchereria bancrofti) *by Administration of Melarsen Oxide.* Harry M. Rose and James T. Culbertson, Columbia University.

During April and May 1945 eighteen male patients with Bancroftian filariasis were treated in Puerto Rico with a new trivalent arsenical compound, melarsen oxide. None of these patients exhibited symptoms of the infection, but all showed microfilariae in night blood specimens.

Three patients received the drug orally, 50 mgm three times daily, for seven to fourteen days. Seven individuals were given the drug, dissolved in propylene glycol, intravenously in doses of 7.5 mgm daily for seven consecutive days. The remaining eight patients received 10 mgm intravenously daily for eight or nine consecutive days.

In all cases control microfilarial counts were done before treatment was begun and at intervals thereafter. Six to seven months after treatment microfilariae had completely disappeared from the blood of 6 patients, while the counts were markedly reduced in 5 cases, moderately reduced in 4 cases, and unchanged in 3 cases. The most favorable results were obtained in the group of patients that were given the 10 mgm doses of melarsen oxide intravenously.

Severe reactions, characterized by toxic encephalopathy, were observed in two instances, with complete recovery in both. These reactions indicate that the drug must be administered with caution, but do not detract from the observation that arsenical compounds of this class, the arsenoxides, may be of value in the therapy of human filarial infections. (This work was done under contract with the Office of Scientific Research and Development.)

40. *Studies of Sheep Parasites. VI. Observations on Weather in Relation to Untreated Nematode Infections.* Philip A. Hawkins, Michigan State College.

Studies of egg counts of sheep over a three-year period have shown that infections with strongyles and trichostrongyles are directly proportional to moisture and temperature. Ewes become reinfected with the first onset of warm weather in the spring. They undergo a light infection, and then are capable of throwing off most of this and maintaining a low-grade infection during the summer. If excessive rainfall occurs during the summer, the resistance of the animal is broken down and heavy reinfection occurs. In the lamb the same picture is observed except that the infection is much more severe and occurs three to four months later. In the lamb the infection is less severe and of shorter duration in dry summers, whereas in summers with excessive precipitation, heavy infection with accompanying high mortality occurs.

41. *Immunity to* Necator americanus *Infection.* PAUL C. BEAVER, Tulane University.

An experimental infection of three months duration failed to influence appreciably the development of subsequent infections of *Necator americanus* in a human subject. Although the severity of cutaneous reaction to the penetration of larvae was increased with each succeeding exposure, the intestinal infection as measured by output of eggs was proportionate to the number of larvae used. The initial exposure to 200 larvae produced counts of 4,000 to 5,000 eggs per cc (f.s.b.) and additional exposures to 800 larvae increased the counts to above 20,000. Attempts to obtain precipitin reaction to living filariform larvae of *N. americanus* in the subject's serum were consistently negative after 18 months of continuous infection.

42. *Infection Experiments with a Hookworm of the Cotton Rat.* LYELL J. THOMAS, University of Illinois.

Infective filariform larvae were obtained from fecal cultures which contained a natural infection of hookworm eggs from the cotton rat. Although nearly 150 of these larvae were applied to the left forearm of the author and penetration was observed under the microscope no creeping eruption or intestinal infection occurred.

Cotton rats were easily infected by giving them larvae in their drinking water. The rats could not be infected with *Necator americanus.*

43. *Hydrogen Ion Concentration as a Factor in Age Resistance to the Fowl Ascarid.* B. B. RIEDEL AND J. E. ACKERT, Kansas State College.

It is known that young chickens kept on an adequate diet will develop, as they grow older, increased resistance, or age resistance to the growth of the fowl nematode *Ascaridia galli.* Various factors in the increased resistance have been determined and evidence has been presented which indicates that the limiting factor is given off from the wall of the small intestine into the lumen where the young ascarids live. The duodenal mucus of this portion of the intestine appears to contain a resisting factor. This substance is secreted by the goblet cells. However, the possibility remained that variations in the hydrogen ion concentration might be an important factor in the resistance.

Two groups of single comb white leghorns of sixty chicks each were used to make the study. Twenty-one days before autopsy each chicken of both groups was given 500 *Ascaridia galli* eggs. The first group of chickens was killed on the 28th day, while the second group was killed on the 93rd day after hatching. Comparisons between the two groups of chickens were made on the basis of worm number, worm length and hydrogen ion concentration.

The four-week-old chicks had an average of 11.8 worms, while the thirteen-week-old fowls had an average of 2.3 worms. The average length of the worms of the four-week group was 23.3 mm, while that of the older group was 20.6 mm. The hydrogen ion concentration of the worm habitat in the four-week-old chicks was 6.50 as compared with 6.34 for the thirteen-week-old chickens—but a slight difference.

These results which show a nearly constant hydrogen ion concentration for chickens from four to thirteen weeks of age, indicate that variation in hydrogen ion concentration is not a factor in age resistance of chickens to ascarids.

44. *An Anomalous Experience with Phenothiazine.* PAUL D. HARWOOD, Dr. Hess and Clark, Inc., Ashland, Ohio.

In general the larger animal is given the larger dose of an anthelmintic to maintain approximately the same lethal concentration of drug in the intestines of small and large hosts. However, experience with more than 200 chickens suggests that the effective dose of phenothiazine against *Heterakis gallinae* is lower for heavy birds than for light birds. Thus 0.44 grams of phenothiazine per bird removed 89.8 per cent of 675 Heterakis from 12 Brown Leghorn cockerels averaging 1208 grams; 0.5 grams removed 95.7 per cent of 1854 Heterakis from 18 Ancona cockerels averaging 1847 grams; 0.35 gram removed 99.3 per cent of 1083 Heterakis from 17 White Rock cockerels averaging 2004 grams; and 0.1 gram of phenothiazine removed 91.3 per cent of 987 Heterakis from 32 White Rock cockerels averaging 3048 grams. Remaining data may not be presented in an abstract. Since these experiments were not designed primarily to test the effect of size of host on anthelmintic medication, the observed results may be due to some factor other than size of host at time of treatment, such as variety. However, very limited tests with phenothiazine against Heterakis in turkeys and pheasants suggests that the drug is very effective in the former host but of doubtful value in the latter. These data are presented at this time largely to raise the question of the true relationship between size of dose and size of host.

45. *Studies on the Cytochrome Oxidase of the Pig Ascaris.* C. A. HERRICK AND MARIE THEDE, University of Wisconsin.

The oxygen uptake of pig ascaris homogenate was determined by means of the Warburg

apparatus using the Potter technique. The oxygen uptake of the homogenate alone was negligible but was slightly increased by the addition of sodium succinate. When cytochrome c was added to the tissue-succinate mixture it was immediately and permanently reduced and the respiration of the tissue was not increased.

When the oxygen carrier, brilliant cresyl blue, was added to the homogenate plus sodium succinate it greatly increased the oxygen uptake of the tissue. It was, however, ineffective in the absence of this substrate.

The use of ascorbic acid as a substrate to furnish an excess of reduced cytochrome c was ineffective in increasing the tissue respiration. This, together with the fact that when diethylstilbestrol was added to the tissue-succinate-cytochrome mixture, respiration was not reduced, indicates that cytochrome oxidase is lacking in the adult pig ascaris.

46. *Additional Studies on the Effects of Nodular Worm Infections on Calves During the Prepatent Period.* Roy L. Mayhew, Louisiana State University.

The results obtained in experiments in which five calves were inoculated with pure cultures of nodular worm larvae indicate that very severe symptoms of parasitosis develop during the prepatent period of the infection. There is loss in weight, the animals refuse to eat and drink, and at post-mortem much inflammation is evident in the small and large intestine. These symptoms are generally believed in natural infections to be associated with damage caused by the adult parasites. Calves that survive the prepatent period gain in weight and strength during the period of greatest egg-count in the adult period of the life of the parasite. Such evidence suggests that the improvement following the use of anthelmintics, when severe parasitism is diagnosed, is actually a natural comeback following the effects that were produced by the larvae during the prepatent period rather than by elimination of the adults. These findings confirm those reported in a previous publication (Cornell Vet. **34**: 299–307) giving the results of pure stomach worm and mixed stomach worm and nodular worm inoculations.

47. *The Relationship in Mice of Intestinal Emptying Time and Natural Resistance to* Hymenolepis. John E. Larsh, Jr., University of North Carolina.

Mice have a strong natural resistance to *H. nana* var. *fraterna* as shown by low percentages of cysticercoid development (usually much less than five) following initial infection. The explanation for this is unknown, but since large numbers of viable eggs pass unchanged through the intestine, it has been suggested that emptying time may be involved. To obtain an idea of the elimination rate, a group of mice was given carbon ink solution by mouth. Periodic autopsies revealed large amounts of the ink in the lower colon within 15–20 minutes. If eggs are eliminated similarly, it seems plausible that many would be excreted before sufficient time elapsed for hatching. If this is the case, then slowing the rate of elimination should result in higher percentages of cysticercoid development. In order to slow intestinal passage, drug action has been the most successful method used thus far. Opium given parenterally in various concentrations retarded the passage of ink from one to several hours. Moreover, when given just prior to infection, this drug in test animals increased the percentage development of cysticercoids many times above that of controls. While opium may have more than a single effect, it is highly suggestive that the increased percentage development of cysticercoids in mice given the drug was due to retarded passage of the eggs.

48. *Cercarial Production in Snails and Metacercarial Infections in Fish from Carrol Lake, Wisconsin.* L. O. Nolf, University of Wisconsin, Wisconsin Conservation Department, and University of Iowa.

During the summer of 1944, 2776 snails were isolated to get emerging cercaria. Seven hundred sixty of these produced cercaria. In 1945, 686 snails out of 2773 shed cercaria. The cercarial production was low during May with a sharp rise in June reaching a peak early in July followed by a slight decline through August. The highest percentage of infection with furcocercous cercaria was found in *Stagnicola exilis*. The second highest was in *Physella sayii*. While *Heliosoma trivolvis* was third in the percentage of snails that shed furcocercous cercaria, because of their greater abundance, they produced nearly half of the total infections of this type. During the summer of 1945, in collaboration with F. G. Brooks, we found a number of Xiphidiocercaria that readily penetrated fish, some with lethal effect. The incidence of infection in snails varied at different stations. The percentage of infected snails remained quite constant for the two seasons.

A pepsin-digest technique was used to make a quantitative study of the metacercarial infections in fish. The numbers of metacercaria recovered from fish ranged from one to 90,250. The highest was from an experimentally infected fish. This was an intensity of infection of 1612 metacercaria per gram weight which is about four times as great as the highest natural infection found, namely, 20,600 or 412 metacercaria per gram weight.

Blue gills had more than twice as many metacercaria per gram body weight as did the Perch. This difference is even greater in the zero age group. Differences in degree of infection was noted in fish from different stations.

49. *Ecology of the Metacercariae of* Fasciola hepatica *in Southern Texas and Its Relationship to Liver Fluke Control in Cattle.* O. Wilford Olsen, U. S. Bureau of Animal Industry.

In southern Texas, where the snail intermediate host (*Stagnicola bulimoides techella* (Hald.)) of the liver fluke lives primarily in temporary pools, the cercariae are able to encyst only when standing water is present on the pastures which is usually during the winter and early spring.

Post-mortem examinations and field studies indicated that both larval and adult flukes were present in cattle during the early summer but primarily only adult flukes were found in the late fall. This condition suggested that the pastures became free from infective metacercariae during the summer. In order to test the viability of the metacercariae during the later summer and fall of 1944, one fluke-free sheep was placed on each of 2 pastures on the first of each month, beginning with September and extending through March. Fecal examinations were made at monthly intervals to determine when the sheep became infected.

Fluke eggs first appeared February 28, 1945. Allowing 3 months for the flukes to mature following ingestion of the metacercariae, it appeared the pasture was free from viable cysts from September 1 to December 1. How much before September the metacercariae were killed by the heat and drought was not ascertained.

Since larval flukes migrating in the liver parenchyma are not killed by hexachlorethane and young flukes in the bile ducts are more resistant than adults (Olsen, 1944, J. Parasitol. Suppl. 30: 14), medication is most effective late in the fall when the flukes are mature. Moreover, medication in the late fall greatly reduces the number of fluke eggs passing on to the pastures when moisture conditions are favorable for their hatching and infecting the snails.

50. *Determination of the Life History of* Cercaria szidati, *a Furcocercous Larval Trematode of the* Vivax *Type.* Dorcas J. Anderson, Purdue University.

Cercaria szidati Anderson, 1944, penetrates minnows and encysts in the muscles, especially of the tail region. Heavily infected minnows were fed to albino rats, mallard ducklings, and several series of newly hatched chicks. In only a single series of five chicks did the trematodes develop to maturity; two yielded 14 and 30 mature worms, respectively, when killed and examined three days after receiving metacercariae and the remaining three chicks passed eggs but threw off the infection in less than a week. A Great Blue Heron nestling acquired a heavy infection but the egg output fell off rapidly and subsequent massive doses of metacercariae failed to become established. The adult is an undescribed species of *Linstowiella* and the fact that both it and the cercarial stage are monostomatous is of interest since closely related species are typical holostomes. The embryological development of the complex cercarial excretory system has been investigated.

51. *Motion Picture of* Cercaria clausii *Monticelli, a Marine* Rattenkönig *Larval Trematode from the West Coast of Florida.* R. M. Cable, Purdue University, and Richard A. McLean, Academy of Natural Sciences of Philadelphia.

A short motion picture of *C. clausii* illustrates the behavior of this unusual type of larval trematode. In some sequences, the clusters of larvae move as units, all members contracting simultaneously, while in others, the individual cercariae move independently as if attempting to detach themselves from the rosette.

52. *Schistosomiasis.* Paul P. Weinstein, U. S. Public Health Service.

The salient features in the life cycle, geographical distribution, epidemiology, symptomatology, pathology, diagnosis, and methods of treatment of the three types of schistosome infections of man are presented in a colored film strip. It represents the combined efforts of a number of individuals to portray in an attractive and interesting manner the known authoritative information on these diseases. This film strip with an accompanying recorded narration is now being made available to all interested teaching institutions and educational groups by the Training and Education Division of the United States Public Health Service, 291 Peachtree Street, Atlanta, Georgia.

53. *The Laboratory Diagnosis of Schistosomiasis.* M. M. Brooke, U. S. Public Health Service.

This film strip of colored photographs demonstrates the step by step procedures of making laboratory diagnosis of schistosome infections. The examination of fecal samples and urine

specimens include the simple smear, sedimentation, centrifugation, acid-ether, and hatching techniques. For routine concentration purposes, a modified sedimentation and centrifugation technique is recommended. For small samples, and where expense is not an item, the acid-ether test is considered preferable. This film strip has been prepared for use in the courses on "The Laboratory Diagnosis of Parasitic Diseases," currently being offered by the Diagnostic and Training Laboratory of the United States Public Health Service in Atlanta, Georgia. Accompanied by a recorded narration, this strip and others, now in production, will also be made available to teaching institutions and professional groups that request them.

54. *Comparison of Methods for Diagnosing Schistosomiasis* japonica *by Recovery of Eggs from Feces.* George W. Hunter, III, James W. Ingalls, and Minna G. Cohen, Army Medical School.

The following methods for recovering eggs of *S. japonicum* from dog and human stools were tested semiquantitatively: direct smears, sedimentation, sugar flotation, zinc sulfate flotation, zinc sulfate-centrifugation-flotation, acid-ether, and acid-Triton NE-ether. Both the acid-ether and acid-Triton NE-ether proved to be more efficacious than the other methods which were tested.

Routine laboratory tests using direct smears, sedimentation, and acid-Triton NE-ether yielded superior results with the latter technique. A modification of the acid-Triton NE-ether method consisting of 2.5 cc of hydrochloric acid, 2.5 cc of sodium sulfate, 0.06 cc of Triton NE, and 5 cc of ether was tested on dog and human stools and compared with the acid-Triton NE-ether, sedimentation and direct smear methods. This new modification of the acid-Triton NE-ether method appears superior in a limited series of tests to other techniques commonly employed for the recovery of *S. japonicum* eggs.

55. *Periodicity of Microfilariae in the Philippines.* J. L. Avery, Naval Medical School.

Wuchereria bancrofti exhibits two distinct strains based on the presence or absence of periodicity: periodic, in which microfilariae are found in the peripheral circulation only at night; and non-periodic, in which circulating microfilariae may be found in uniform abundance at any time. The geographical distribution of these two strains is well determined, with no overlapping. However, in the strain of *W. bancrofti* encountered in natives of the central Philippine archipelago, small numbers of circulating microfilariae could be demonstrated during the daylight hours and relatively much greater numbers at night. Results of our surveys support the contention of Philippine workers that this condition represents a modified nocturnal type of periodicity rather than either one of the established strains or an overlapping of the two types.

56. *The Thermal Death Point of* Cysticercus bovis. Rex W. Allen, U. S. Bureau of Animal Industry.

Controlled tests to determine the thermal death point of *Cysticercus bovis* were conducted by using 439 cysticerci from four naturally infected host animals. The viability tests used were (1) ability to evaginate in 0.6 per cent sodium taurocholate solution, (2) flame cell motion, and (3) ability to pass undigested through the digestive tract of a human subject.

A total of 192 decapsulated cysticerci were heated gradually in physiologic saline to temperatures of 50°, 53°, 54°, 55° and 56° C. The time required to reach these temperatures ranged from 3 1/3 to 5 1/2 minutes. Viability tests showed evidence of life in cysticerci heated to temperatures as high as 55° C, but showed none in the 132 cysticerci heated to 56° C.

A total of 124 cysticerci were recovered from small pieces of host muscle tissue heated gradually in physiologic saline to internal temperatures of 45°, 50°, 55°, 56° and 57° C. The time required to reach these temperatures varied from 13 1/2 to 30 minutes. It was found that an internal temperature of at least 56° C in the pieces of flesh was necessary in order to kill all the contained parasites. Eight pieces were heated to 56° C, and they were found to contain 46 cysticerci all of which failed to show evidence of life when subjected to the viability tests.

57. *The Nature of the Mechanism of Encapsulation in Trichiniasis.* Wayne W. Wantland, Corrine L. Bardes, and Robert S. Levine, Illinois Wesleyan University.

Following entrance of trichina larvae into the striated musculature of the host, inflammation is set up by the movements and waste products of the rapidly growing larvae, the fiber becomes granular and swells, giving rise to pressure necrosis and degeneration of the surrounding fibers. Considerable white-cell infiltration occurs and the fibers of the interfascicular connective tissue undergo hypertrophy. A delicate parietal layer is then formed around each larva, which is apparently the beginning of a fibrosis resulting from the alternation of the normal condition of the tissues. The infected tissue undergoes rapid histological changes and an intercellular exudate is formed. The delicate parietal layer surrounding the invading parasite arises by a direct and gradual transformation of the minute elements of the exudate. This transformation is

effected by the pressure and tension which is applied to the fibrillations that appear in the exudate, as a result of inflammation and swelling of the invaded fiber. The enveloping sheath becomes thicker as more fibrillated layers are added. The wall becomes homogeneous and hyaline in nature and its deeper layers unite at the poles of the cyst. In some instances complete atrophy of the muscle fiber results; at other times the striation appears normal above and below the cyst and the sarcolemma is continuous with the most external layer of the cyst wall. The fibrous nature of the cyst can be readily seen in both fresh and fixed preparations of infected rat and rabbit diaphragm muscle when viewed directly with the microscope. Photomicrographs of such preparations show the hyaline nature of the capsule.

58. *On the Distribution of Glycogen in the Trematode,* Ostiolum *sp.* JAMES H. WILMOTH AND RHODA GOLDFISCHER, Brooklyn College.

The distribution of complex polysaccharides (i.e., glycogen) has been investigated in *Ostiolum* sp., a parasite of *Rana pipiens,* using histological and histochemical techniques. Best's carmine method, Lugol's solution, and the Feulgen-Bauer reaction were used to demonstrate the location of glycogen. Most reliance was placed on the latter technique. Control tests were conducted on *Ostiolum* and on mouse liver. The paraffin method was employed throughout and complete serial sections of the trematode were used. The presence of specific staining granules in muscle tissue, eggs, and parenchyma of this parasite indicates that glycogen deposits are present in these locations. However, similar granules were not observed in the cuticle, excretory ducts, seminal receptacle, testis, and vitellaria and, therefore, glycogen is considered to be absent from these portions.

Some preliminary studies, employing vital-staining and osmic methods, were made on the structure and distribution of Golgi bodies in this trematode.

59. *Studies on the Respiration of the Frog Lung Fluke,* Ostiolum *sp.* JAMES H. WILMOTH AND NORA LEVITAS, Brooklyn College.

Respiration studies on *Ostiolum* sp. from the lungs of *Rana pipiens,* indicate that this trematode utilizes oxygen from the environment. Varying numbers of worms were placed in Frog Ringer solution in a closed system and the Ringer was tested at regular intervals for oxygen content by the Winkler method. Parasites freshly removed from the host as well as those maintained *in vitro* for periods of time up to five days utilized the oxygen present in the Ringer at much the same rate. Worms stained in a dilute solution of methylene blue and placed in sealed depression slide chambers were able to reduce the methylene blue when free oxygen was no longer present in the environment. Worms maintained *in vitro* for over seven days were motile under anaerobic as well as aerobic conditions.

60. *A Note on the Genus* Axine *Abildgaard (Trematoda; Monogenea).* EMMETT W. PRICE, U. S. Bureau of Animal Industry.

The body outline of species of the genus *Axine* is in general that of an obtuse triangle, the shorter leg of the triangle representing the haptoral part of the body. Haptoral hooks have not been reported for species of the genus *Axine (s.str.).* An examination of several species, including the genotype, *Axine bellones,* revealed a small languette or lobe bearing 2 pairs of minute hooks. This lobe is situated along the row of haptoral clamps at a point corresponding to the distal end of a line drawn through the long, medial axis of the body. Correlated with the presence of this lobe are a U-shaped ovary, an armed vagina and, usually, a more or less definitive pattern of genital spines. Only species having this combination of characters should be included in the subfamily Axininae.

Three genera of Axininae are recognized: (1) *Axine* Abildgaard (Syn. *Cestracolpa* Meserve) (vaginal opening lateral, with horn-like spine), including *A. bellones* Abildgaard (type), *A. cypseluri* (Meserve), *A. gracilis* Linton, *A. inada* Ishii and Sarwada, *A. japonicum,* n.n. for *A. cypseluri* Yamaguti, *A. yamagutii* (Meserve), and *A. triglae* Beneden and Hesse; (2) *Axinoides* Yamaguti (vaginal opening median, with horn-like spine), including *A. aberrans* Goto, *A. meservei* for *A. aberrans* of Meserve, and *A. tylosuri* Yamaguti (type); and (3) *Neoaxine,* n.g. (vaginal opening lateral, with incomplete circle of spines), type and only species *N. constricta* (Yamaguti).

All other species at present in the genus *Axine* will be placed in a new subfamily.

61. *Additional Observations on the Life History of* Gorgodera amplicava *Looss, 1899.* CHAUNCEY G. GOODCHILD, Southwest Missouri State College.

A restudy of the life history of *Gorgodera amplicava* from Cape Cod, Massachusetts, has been made. *Musculium partumeium,* molluscan host of *G. amplicava,* collected from the same ponds as *Musculium securis* and *Sphaerium occidentale,* has been found to be the only natural

host. The large-tailed cercaria of *G. amplicava* agrees closely in most details with published descriptions, but has been found to be much longer than previously reported. A length of 17.4 mm (12 mm–17.4 mm; average about 13.9 mm) has been determined for recently shed cercariae. *Physa sp.* and several species of tadpoles, including those of *Rana catesbeiana, R. palustris, R. clamitans* and *Hyla versicolor* are natural metacercarial hosts while *Ambystoma sp.* has been experimentally infected with these cercariae. Penetration and early encystment of metacercariae have been observed in laboratory fed odonatan larvae (*Enallagma sp.*). The vertebrates in which metacercarial excystment occurs with subsequent orientation of the young worms to the excretory ducts are: *Rana catesbeiana, R. palustris, R. clamitans* and *R. pipiens.* Excysted worms have been recovered from the oviducts of *Ambystoma sp.* Normal metacercarial excystment takes place in the gut of *Triturus viridescens viridescens,* but the worms become quickly trapped in mucus covered fecal pellets and are eliminated. This fact may be a possible explanation of the "immunity" of certain amphibian species to gorgoderid trematodes. The miracidia, approximately 55 μ long by 82 μ wide, are covered with fifteen epidermal plates arranged in three rows. The pattern is 6, 6, 3. The free-swimming miracidia are drawn, with incurrent water, into the bivalve host where they penetrate the gills and transform into mother sporocysts.

62. *Studies on Parasites of Bassalian Fishes.* Ross F. NIGRELLI, New York Aquarium and New York Zoological Society.

Little is known about the parasites of bathybial and semi-bathybial fishes. Through the courtesy of Dr. William Beebe (New York Zoological Society) several species of these rare forms were made available for study. In this preliminary survey the following species were examined: *Cyclothones* spp. (100–1000 fathoms), *Lampanyctus cuparius* Taning (50–1000 fathoms), and *Echiostoma tanneri* (Gill) (500–900 fathoms). *E. tanneri* was the only form found infected. Larval nematodes of a single species belonging to the subfamily Anisakinae were found encysted in the body cavity. No special modifications were present in the parasite that could be correlated with either its host or its environment. The parasite belongs to that group of ascarids characterized by the presence of an oesophageal appendix and absence of an intestinal caecum. The worms measure from 7–25 mm in length, and from 0.4–0.6 mm in width (at the region of the vulva). The oesophagus varies in length from 1.2–2.9 mm and the ventriculus from 0.5–0.7 mm. The appendix is comparatively long, varying from 2.4–3.8 mm. Typical trilobed larval lip structures and boring tooth are present. The posterior end terminates in a retractile spine-like structure. The anus is situated from 0.5–0.7 mm from the tip. Giant excretory (?) cells are present in the region of the terminal part of the intestine. It would be difficult to state what the final hosts of these parasites are, or how the fish become infected at these extreme depths since nothing is known about their predators or what they eat.

63. *Parasite Studies of Quail,* Colinus virgianus *and* Colinus virgianus texanus, *in Mississippi.* J. W. WARD, Mississippi State College.

A total of 273 Bobwhite quail, *Colinus virgianus* and ten Mexican quail, *Colinus virgianus texanus,* collected in Mississippi have been examined for internal parasites. The collection of material extended over a period of five years. A comparison of infestations in the ten soil areas of Mississippi has been made. It was shown that parasitism reached the highest level in 1941–42. Those birds collected from the Brown Loam and Bluff areas were the most heavily parasitized. Eleven species of internal parasites were found. They were distributed as follows: seven nematodes, *Heterakis gallinae* (Gmelin, 1790) Freeborn, 1923; *Heterakis bonasae,* Cram, 1927; *Subulura brumpti* (Lopez Neyra, 1922) Cram, 1926; *Seurocyrnea colini* Cram, 1927; *Habronema pileata* Walton, 1927; *Syngamus trachea* (Montague, 1811) Chapin, 1925; *Trichostrongylus pergracilis* (Cobbold, 1873) Railliet and Henry, 1909; three cestodes, *Raillietina (Skrjabinia) cesticillus* (Molin, 1838) Joyeux, 1923; *Hymenolepis carioca* (Magalhaes, 1898) Ransom, 1902; *Rhabdometra odiosa* (Leidy, 1887) Jones 1929 and one or more coccidia, *Eimeria spp.*

A key has been prepared to be used in identifying the known species of helminth parasites of quail.

64. *The Nematode Parasites of the Bufoninae (Amphibia—Salientia—Procoela—Bufonidae) I.* A. C. WALTON, Knox College.

The annotated list of the Nematode parasites of the Bufoninae indicates the following hosts and parasites: 1a. BUFO AMERICANUS (Brazil, Zool. Gard.)—*Oswaldocruzia subauricularis.* 1b. (U.S.A.)—*Hedruris* sp.?, *Oswaldocruzia ?filiformis, O. leidyi, O. pipiens, "Oxyuris" dubia,* and *Rhabdias bufonis.* 2. B. BOREAS (U.S.A.)—*Cosmocercoides dukae, Oswaldocruzia waltoni,* and *Spironoura pretiosa,* 3. B. BUFO (Europe)—*Aplectana acuminata, Cosmocerca commutata, C. ornata, "Filaria" jubae, Oswaldocruzia filiformis, Oxysomatium brevicaudatum, O. contortum,*

O. longispiculum, O. praeputiale, "Oxyuris" mucronata, "O." tarda, Rhabdias bufonis, R. microoris, R. rubrovenosa, and *R. sphaerocephala.* 4. B. B. ASIATICUS (China)—*Africana howardi,* larval *Habronema mansoni,* and *Rhabdias bicornis.* 5a. B. B. FORMOSUS (China)—*Africana howardi.* 5b. (Japan)—*Capillaria bufonis,* and *Oswaldocruzia filiformis* (= *O. insulae*). 6. B. B. GARGARIZANS (China)—*Oswaldocruzia peipingensis.* 7a. B. B. JAPONICUS (China)—*Cosmocercoides pulcher,* and *Spinicauda japonica.* 7b. (Japan)—*Capillaria bufonis, Cosmocercoides pulcher, Oswaldocruzia bialata, Rhabdias incerta,* and *Spinicauda japonica.* 8. B. CALAMITA (Europe)—*Hedruris androphora.* 9. B. CANORUS (U.S.A.)—*Cosmocercoides dukae.* 10. B. COGNATUS (U.S.A.)—larval Physalopterans. 11. B. COMPACTILIS (U.S.A.)—larval Physalopterans. 12a. B. CRUCIFER (Brazil)—*Aplectana crucifera, Cosmocerca brasiliensis, Oswaldocruzia subauricularis, Oxyascaris similis, Oxysomatium membranosa,* and *Schulzia subventricosa.* 12b. (Zool. Gard., Europe)—*Oswaldocruzia filiformis.* 13. B. FOWLERI (U.S.A.)—*Cosmocercoides dukae, Oswaldocruzia pipiens, O. waltoni,* Physalopteran larvae, *Rhabdias ?bufonis, R. ranae,* and *R.* sp.? 14. B. HIMALAYANUM (India)—*Cosmocercoides bufonis.*

65. *The Nematode Parasites of the Bufoninae. II.* A. C. WALTON, Knox College.

15a. BUFO MARINUS (Brazil)—*Ankylostoma* sp.?, *Aplectana acuminata, A. vellardi, Cosmocerca commutata, "Filaria"* larvae, *Foleyella vellardi, Oswaldocruzia mazzai, O. subauricularis, Oxyascaris similis, Oxysomatium membranosa,* and *Rhabdias fülleborni.* 15b. (Zool. Gard., England)—*"Filaria"* larvae, Microfilariids, and *Rhabdias bufonis.* 15c. (Fr. Guiana)—*"Filaria"* sp.? 15d. (Mexico)—*Aplectana hoffmanni, Cruzia morleyi, Icosiella* sp.?, *Ochoterenella digiticauda, Oswaldocruzia subauricularis,* and *Rhabdias sphaerocephala.* 15e. (Panama)—*"Filaria"* sp.? 15f. (Puerto Rico)—*Ascaris lumbricoides* eggs, and *Trichuris trichiura eggs.* 16. B. MAURITANICUS (Africa)—*Aplectana* sp.?, *Oxysomatium macintoshii,* and *Spirocerca lupi.* 17a. B. MELANOSTICTUS (Burma)—*Meteterakis govindi, Oswaldocruzia filiformis,* and *Oxysomatium macintoshii.* 17b. (China)—*Meteterakis govindi, Oswaldocruzia heparia, O. hoepplii, Oxysomatium macintoshii, Rhabdias bufonis,* and *Spironoura pectinospiculata.* 17c. (Formosa)—*Spinicauda bufonis.* 17d. (Fr. Indo-China)—*Oswaldocruzi filiformis, O. hoepplii,* and *Oxysomatium macintoshii.* 17e. (Siam)—*Rhabdias brachylaimus,* and *Spiroptera* sp.? 18. B. PELTOCEPHALUS (Cuba)—*Aplectana hamatospicula,* and *Strongyloides amphibiophilus.* 19. B. QUERCICUS (U.S.A.)—*Cosmocercoides dukae,* and *Oswaldocruzia pipiens.* 20. B. REGULARIS (Cent. Africa)—*Africana africana, Amplicaecum involutum, "Filaria"* (2 spp.?), *Foleyella leiperi* (and larvae), and *Oxysomatium praeputiale.* 21. B. SIMUS (Mexico)—*Aplectana mexicana.* 22. B. STEINDACHNERII (Africa)—Nematodes. 23. B. STOMATICUS (India)—*Oxysomatium macintoshii,* and larval Physalopterans. 24. B. TERRESTRIS (U.S.A.)—*Cosmocercoides dukae, Oswaldocruzi leidyi, O. pipiens, Oxysomatium americana,* and *Rhabdias ranae.* 25. B. VALLICEPS (U.S.A.)—*Aplectana* sp.?, *Cosmocercoides dukae,* and *Oswaldocruzi pipiens.*

66. *The Nematode Parasites of the Bufoninae. III.* A. C. WALTON, Knox College.

26a. BUFO VIRIDIS (Africa)—*Oxysomatium macintoshii.* 26b. (Europe)—*Agamospirura* sp.?, *Aplectana acuminata, A. brumpti, Atractis* sp.?, *Cosmocerca commutata, C. ornata, "Filaria" parva, "F." unguiculata, Oswaldocruzi filiformis, Oxysomatium brevicaudatum, O. linstowi, O. longispiculum, O. macintoshii, "Oxyuris" tarda, "O." tba, Rhabdias bufonis, R. microoris, R. rotundata,* and *R. rubrovenosa.* 27. B. WOODHOUSEI (U.S.A.)—*Abbreviata ranae,* and *Oswaldocruzia pipiens.* 28. BUFO spp.? (Argentina)—*Oswaldocruzi mazzai,* and *O. subauricularis.* 29. BUFO spp.? (Europe)—*"Filaria"* larvae, and *Oswaldocruzi filiformis.* 30. NECTOPHRYNOIDES VIVIPARA (N. Africa)—*Oxysomatium macintoshii.* 31. Bufonid (Africa)—*Ornecascaris chrysanthemoides,* and *Oxysomatium dogieli.* 32. "Toad" (Africa)—*Amplicaecum gedoelsti, A. involutum,* and *Foleyella duboisi.* 33. "Toad" (Columbia)—*"Filaria" columbi.* 34. "Toads" (Europe)—*Acleurostrongylus abstrusus.*

Records have been obtained from two genera (24 spp., and 5 supspp.) of the Bufoninae—representing every continent except Australia. 31 genera (81 spp.) of Nematoda (a number of them larval forms) are reported. Of these, *Rhabdias* (10 spp.), *Oswaldocruzia* (10 spp.), *Oxysomatium* (9 spp.), and *Aplectana* (7 spp.) are the genera best represented. In addition, eggs or larvae of three species normally found in mammals have been reported.

67. *The Clinical Diagnosis of Schistosomiasis* mansoni *by Rectoscopic Biopsy.* F. HERNÁNDEZ MORALES AND JOSÉ F. MALDONADO, University Hospital and School of Tropical Medicine, San Juan, Puerto Rico.

The original method devised by Ottolina and Atencio (Revista de la Policlínica Caracas, Venezuela, **XII**(73) : 1–35, Nov.-Dec. 1943) consists in obtaining a fragment, the size of a large grain of rice, from any point at the anterior half of the rectum, but particularly from the right dorsoventral valvular fold (plica coccygea et sacralis) which serves as a better point of reference

for the rectoscopist. This fragment is digested in 4 per cent potassium hydroxide for three hours at 60 to 80 degrees C, centrifuged and the sediment examined under the microscope. We have modified this technique by examining the sample pressed between two slides without any previous treatment. By this modification we have obtained the following decided advantages over the original method: The method of examination is simplified and made more accurate; eggs are not altered in their actual appearance so that it is possible to differentiate between live and dead eggs and thus, with considerable control of the situation, to tell active from extinguished infections. The rectoscopic biopsy is a marked improvement over other methods of clinical diagnosis of schistosomiasis *mansoni*, particularly in case of very light infections. This is supported by the data presented by Ottolina and Atencio and our studies in progress at present.

68. *Schizomycetes parasitic in* Paramecium bursaria. RALPH WICHTERMAN, Temple University.

In cultures of a race of zoöchlorellae-free *Paramecium bursaria*, fairly large numbers of individuals were discovered which were parasitized with Schizomycetes. These spherical microörganisms, which stain with the Feulgen reaction measure less than a micron and exist in globular aggregates from approximately 3 to 45 microns in diameter in the endoplasm of paramecia. Individual specimens contain from one to twelve of these masses. Frequently four or fewer large masses of parasites are seen in which the body of the protozoön is misshapen. In severe cases of parasitism, the host assumes an abnormal pyriform shape with the aggregate of parasites at the wide end of the body.

In heavily parasitized paramecia the micronucleus is always present and appears normal but is not found in its typical position next to the macronucleus. Instead, the micronucleus is located at either end of the ciliate. On the other hand, the macronucleus appears to be attacked. In many cases the bacterial aggregate appears pressed against the macronucleus forming a cup-shaped depression and resulting in its hypertrophy or structural alteration. In such specimens the macronucleus is considerably smaller than in typical animals and suggests that macronuclear material is utilized in the metabolism of these microörganisms. It is easy to understand that the larger masses of parasites interfere not only with cyclosis but other trophic functions of the cell as well.

Generally, parasitized paramecia do not conjugate with members of the opposite mating type but one case was found in which a specimen with a bacterial aggregate measuring 32 microns was joined in conjugation at the stage of pronuclear exchange. Also a fission stage was found in which the macronucleus and micronucleus had completed division but the body of the protozoön had failed to constrict or divide. There is shown in these cases, the persistence of nuclear division in spite of parasitism. (Aided by a grant from the Committee on Research and Publication, Temple University.)

69. *Chemotherapy of Filariasis* (Litomosoides carinii) *in the Cotton Rat by the Administration of Stibanose* (=*Solustibosan*). JAMES T. CULBERTSON AND ELIZABETH PEARCE, Columbia University.

Ten cotton rats all naturally infected with the filarial worm *Litomosoides carinii* and all presenting microfilariae in their tail bloods were repeatedly injected intramuscularly with stibanose, a pentavalent antimony compound. Five animals in one group were given 133.4 mg of drug daily for two weeks. The number of circulating microfilariae in these animals gradually declined and finally all the rats were negative on tail blood examination; one rat was negative on the twenty-first day from the beginning of treatment, two others were negative by the thirty-fifth day, and the remaining two were negative by the fifty-fourth day. These animals were autopsied after the tail blood was negative and their pleural spaces were searched for adult filarial worms. Adult worms, which were found in all rats, were in every case dead and embedded in exudate.

The second group of five rats was treated with 60 mg of drug daily for only six successive days. These animals were autopsied on either the fourteenth or twenty-first day after treatment began. Although all the rats still presented microfilariae in the tail blood at autopsy, the adult worms removed from the pleural space were dead and embedded in exudate. The drug evidently manifested greater activity on adult parasites than on microfilariae.

The filariasis of cotton rats can be eradicated by repeated administration of stibanose. Because of the excellent tolerance man is known to have for this drug, the trial of stibanose for the treatment of human filariasis is strongly indicated. (This work was done under contract with the Office of Scientific Research and Development.)

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1928	New York	1935	St. Louis	1942	(New York, cancelled)
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Chernoff, Harry A. 55th Station Hospital, A.P.O. 782, c/o P.M., New York, N. Y.

Coffin, David L. Department of Pathology, University of Pennsylvania, Philadelphia, Pennsylvania.

Conlin, John Francis. 103rd Evacuation Hospital, A.P.O. 403, c/o P.M., New York, N. Y.

Deane, Leonidas M. Department of Parasitology, Instituto Evandro Chagas, Belem, Pará, Brazil.

Deane, Maria Paumgartten. Department of Parasitology, Instituto Evandro Chagas, Belem, Pará, Brazil.

Dingee, Ruth Foster. Parasitology Laboratory, Medical College of South Carolina, Charleston, South Carolina.

Drudge, J. Harold. Station Veterinarian, Camp Gordon Johnston, Florida.

Duff, Fratis L. School of Aviation Medicine, Randolph Field, Texas.

Fernandez, Fausto. National Antimalarial Service, Health Department, Lima, Peru.

Finkelstein, Samuel Manuel. 294 Washington St., Boston, Massachusetts.

Forman, Douglas N. Christian Medical Council for Overseas Work, 156 Fifth Avenue, New York, N. Y.

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Giffen, Horace K. Youngstown Hospital, Youngstown, Ohio.

Gordon, William H. 1102 David-Whitney Building, Detroit, Michigan.

Greene, David G. 23rd General Hospital, A.P.O. 377, c/o P.M., New York, N. Y.

Geiss, George W. 1160th Army Air Force, Base Unit, A.P.O. 603, Unit 1, c/o P.M., Miami, Florida.

German, William McKee. Department of Pathology, University of Cincinnati, Cincinnati, Ohio.

Grocott, Robert G. Board of Health Laboratory, Ancon, Canal Zone.

Hood, Marion. Department of Public Health, Louisiana State University, New Orleans, Louisiana.

Jeffery, Geoffrey M. Health and Safety Department, Tennessee Valley Authority, Wilson Dam, Alabama.

Jewell, Ross L. Department of Pathology, Kansas State College, Manhattan, Kansas.

Kaufman, Bernard, Jr. 2442 Broadway, San Francisco, California.

Keegan, Hugh L. 7th Service Command Medical Laboratory, Ft. Omaha 11, Nebraska.

Knight, Alva A. 122 S. Michigan Avenue, Chicago 3, Illinois.

Leighton, Leslie H. 1802 Massachusetts Ave., Cambridge, Massachusetts.

Lieberthal, Milton M. Moore General Hospital, Swannanoa, North Carolina.

Lucas, Thomas L. Headquarters, 78th Infantry Division, A.P.O. 78, c/o P.M., New York, N. Y.

Lyons, Randolph. 3439 Prytania Avenue, New Orleans 15, Louisiana.

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[1] To December 1, 1945. The last complete membership list was printed in Journal of Parasitology, 1942, **28** Suppl.: 35–50. The names of members elected thereafter up to August 1st, 1944. appeared in Journal of Parasitology, **30** Suppl.: 23 and 24, 1944.

MARHOLIN, HERMAN E. 40th Malaria Survey Unit, A.P.O. 322, c/o P.M., San Francisco, California.
MARTIN, DONALD S. Duke Hospital, Durham, North Carolina.
MATERNY, MARGARET S. 2814 Pasadena St., San Diego 9, California.
MAXWELL, ELMER STEPHENS. 190 N. Upper St., Lexington 15, Kentucky.
MAXWELL, NANCY. Lankenau Hospital Research Institute, Philadelphia, Pennsylvania.
MERRILL, GEORGE G. Department of Medicine, Johns Hopkins University, Baltimore, Maryland.
NEHAUL, BALBIR BALL GREENE. Central Medical Laboratory, Georgetown, British Guiana.
NEUMAYER, ELEANOR M. Zoological Division, U. S. Bureau of Animal Industry, Beltsville, Maryland.
NEWTON, WALTER L. Health and Safety Division, Tennessee Valley Authority, Wilson Dam, Alabama.
OHL, HARRY E. 15th Medical General Laboratory, A.P.O. 534, c/o P.M., New York, N. Y.
PAPINEAU, ALBAN. Plymouth Clinic, Plymouth, North Carolina.
PIMENTEL IMBERT, MANUEL FELIPE. International Hospital, Trujillo City, Dominican Republic.
POINDEXTER, HILDRUS A. Department of Bacteriology, Howard University, Washington, D. C.
PORTER, RICHARD J. School of Public Health, University of Michigan, Ann Arbor, Michigan.
POWELL, CHARLES A. Massachusetts Memorial Hospitals, Boston, Massachusetts.
PRATT, IVAN. Health and Safety Division, Tennessee Valley Authority, Wilson Dam, Alabama.
QUINN, LOYD Y. Clinical Laboratory, Station Hospital, Boca Raton Air Field, Florida.
REESE, JOHN D. Ninth Service Command Laboratory, Fort Lewis, Washington.
ROBERTS, IRWIN H. P. O. Box 704, Albuquerque, New Mexico.
RUSSELL, CATHERINE M. Department of Bacteriology, New York Medical College, New York 29, N. Y.
RUSSELL, PAUL F. Army Medical School, Washington, D. C.
SCHLOSSER, RALPH J. 420th Medical Composite Unit, A.P.O. 709, c/o P.M., San Francisco, California.
SHRAPNEL, BLISS C. Gorgas Hospital, Ancon, Canal Zone.
SIMPSON, WILLIAM F. Department of Biology, Catholic University of America, Washington, D. C.
SMITH, MILTON S. 85th Station Hospital, A.P.O. 923, c/o P.M., San Francisco, California.
SPIES, TOM DOUGLAS. Department of Medicine, University of Cincinnati, Cincinnati, Ohio.
STORCH, SIDNEY. 96th Evacuation Hospital, A.P.O. 230, c/o P.M., New York, N. Y.
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TOMLINSON, WRAY J. A.P.O. 834, c/o P.M., New Orleans, Louisiana.
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WAGNER, EDWARD D. Biology Department, Atlantic Union College, South Lancaster, Massachusetts.
WILLIAMS, THEODORE S. Department of Pathology and Parasitology, Tuskegee Institute, Alabama.
WRIGHT, BERTRAND A. Armour Laboratories, Chicago 9, Illinois.
WYBORNEY, EUGENE H. 36th Field Hospital, A.P.O. 245, c/o P.M., San Francisco, California.
YOLLES, STANLEY F. 392 Medical Composite Unit, A.P.O. 869, c/o P.M., Miami, Florida.
YOLLES, TAMARATH KNIGIN. 392 Medical Composite Unit, A.P.O. 869, c/o P.M., Miami, Florida.
ZUCKER, ISADORE. Bruns General Hospital, Santa Fe, New Mexico.

APPLICATION FOR HOUSING ACCOMMODATIONS FOR ANNUAL MEETING, ST. LOUIS, MO., MARCH 28TH–30TH, 1946

All reservations for hotel rooms or other housing accommodations for the St. Louis Meeting must be filed not later than March 17th, 1946, with:

Housing Bureau, A.A.A.S.,
910 Syndicate Trust Bldg.,
St. Louis 1, Mo.

The name of each person must be listed for whom reservation is requested together with the type of accommodation desired. The definite dates and hours of arrival and departure must be submitted for each guest. The Jefferson Hotel will be the official headquarters of the American Society of Parasitologists and the meetings will be held at this hotel. Because of the shortage of rooms, it is urged that whenever possible two or more members submit applications for a single room, the rate at the Jefferson Hotel for one person is $3.50 to $5.00 per day. The names of other leading hotels and their rates for one person follow:

American	$2.00 – $3.00
Claridge	3.00 – 4.00
Lennox	3.00 – 5.00
Statler	3.50 – 5.00

The above information is from the Office of Harold A. Meyerhof, Executive Secretary, in charge of arrangements for the A.A.A.S. Meetings in St. Louis.

J. T. CULBERTSON, *Secretary.*